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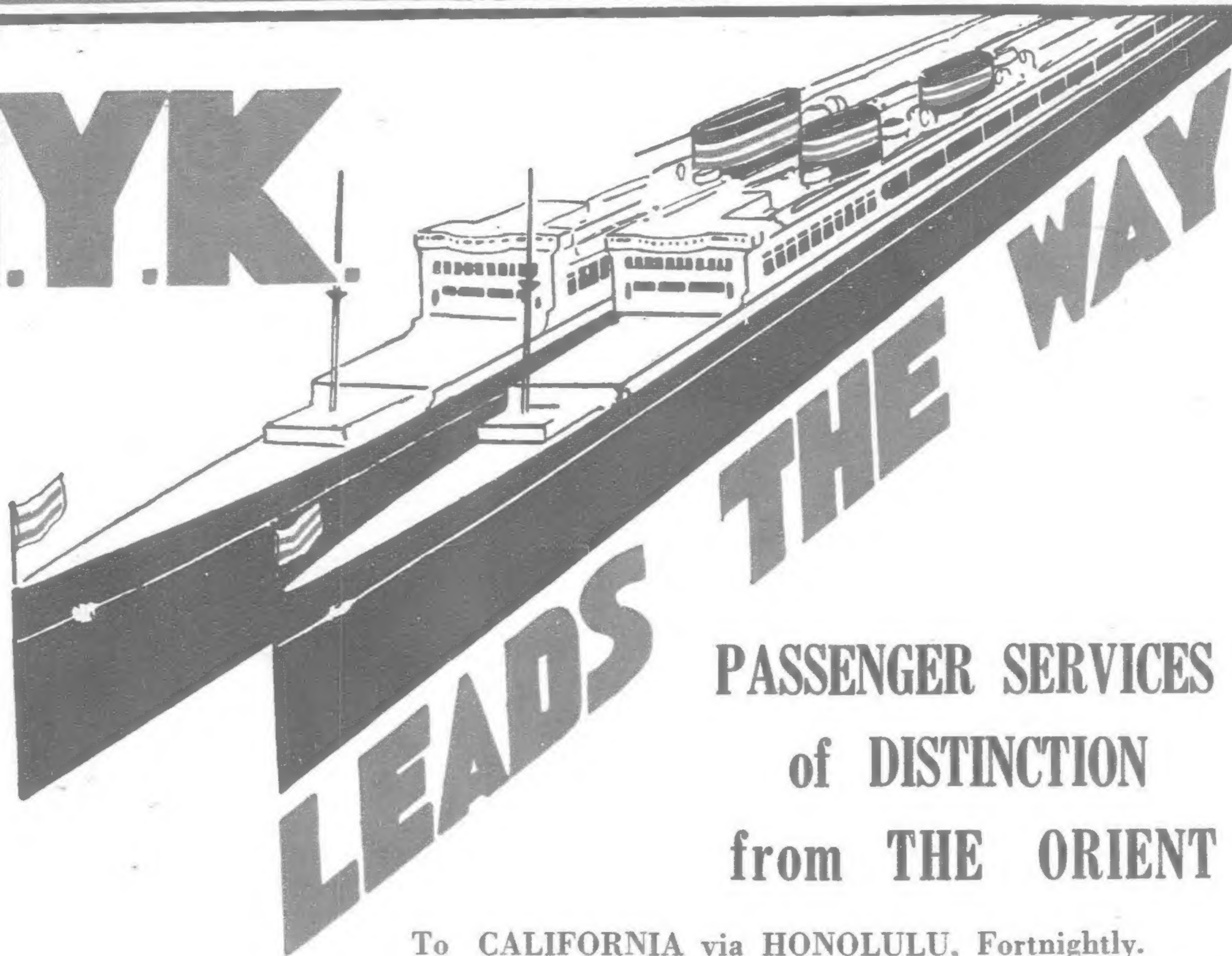
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# The Far Eastern Review

ENGINEERING

FINANCE

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VOL. XXVI

SHANGHAI, JUNE, 1930

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## An Ominous Situation



R. Hallett Abend, Chief Correspondent in China for *The New York Times* who returned to Shanghai from the United States on June 14, carried a message to the Chinese people delivered through *The Shanghai Times* that merits their most serious attention. The gist of Mr. Abend's message is that "Big Business" in the United States, the heads of great banking houses and the executives of world-wide industrial concerns are becoming keenly interested in China as a potential market, and as a result of this interest are beginning to discuss the advisability of some form of international action designed to put an end to China's civil wars.

"Many leaders of the business world are now looking towards China, where nearly half a billion human beings are being steadily impoverished by confiscatory taxation levied for indecisive civil wars. The foreign business leaders consider that if China could enjoy a few years of peace, security and alleviation from crushing war taxes, that China would be able and eager to buy vast quantities of things which could be profitably produced by factories now idle.

"These business leaders point to the fact that Great Britain, too, suffers from unemployment and pays out immense sums for the dole; there is unemployment in France; Germany, trying to pay off her huge war debts, must find wider markets for the products of her industries.

"This keen economic pressure, coupled with the fact that the humanitarian instinct of the world is being aroused on behalf of the Chinese people, affords a double motive for the serious discussion of doing something to bring about peace and stability in China.

"The premature, ill-advised and misleading propaganda concerning the pacification and unification of China, is now acting as a boomerang. Millions of interested Americans believed this propaganda—to-day, when the course of events in China has contradicted what they had been led to believe, they feel indignant at having been fooled, and consequently their former sympathy and patience have changed to impatience and pessimism."

Mr. Abend's message, unpalatable as it may be to the Chinese, is a faithful reflection of the opinion held by the foremost leaders of American finance and industry. Many other evidences of this trend of American sentiment was conveyed to the Publisher of *The Far Eastern Review* during his recent visit to the United States, enabling this magazine to speak with authority in supporting Mr. Abend's message. The American Government and people still sympathize deeply with the Chinese and have waited patiently for an opportunity to contribute in some practical manner towards the stabilization of their country. *But their patience is almost exhausted.*

The Chinese have appealed to the world for "fair play;" for the opportunity to settle their problems in their own way without outside interference. That right has been conceded to them. For years, no Foreign Power has seriously interfered with the outcome of their ceaseless civil wars, except where it became essential to protect the lives and properties of their own nationals or to preserve fundamental treaty rights. But the sheer inability of the Chinese to compound their differences and organize a stable government representative of the whole country, is trying the patience of the rest of the world.

Intent upon their own affairs, the Chinese ignore what is going on in other countries. Unemployment in Great Britain, in the United States, in near-by Japan and in other manufacturing countries, has become an ominous problem. It is fast assuming portentous proportions that menace the very stability of the governments concerned. The fate of these Western Governments,

of millions of workers, of Western Civilization itself, to say nothing of Japan, may depend upon an early solution to these economic difficulties.

China has the right to be mistress in her own house; to settle her problems in her own way; to indulge in continuous and indecisive civil wars; to ruin her own country; to bring misery, starvation and death to millions of her own people; but when these prerogatives of sovereignty are carried to the point where the chaos of China imperils the stability of other Governments and the livelihood of millions of workers in other parts of the world, the day must dawn when the Chinese will be politely but firmly invited to put their house in order. Continued civil warfare in China, boycotts, interference with trade and the general impoverishment of the country, has already brought Japan to the brink of economic disaster. The collapse of Japan or any great diminution of her purchasing power, will affect every other nation in the world.

American business is keenly alive to these conditions. So far has the pendulum swung in the other direction, that sentiment in Wall Street is now strongly and openly in favor of joint international pressure upon China to put a stop to these exhausting civil wars. China is a sovereign state. Her territorial integrity is guaranteed under treaties subscribed to by all the principal Powers, except Russia. No nation covets her territory. Japan's policy towards China is in full harmony and accord with that of the United States. China has no real enemy in the world to-day. She has nothing but friends and well-wishers. She has appealed for a Square Deal and has received it. In return, she has assumed responsibilities that cannot be shirked.

The inability of China to discharge her obligations to the rest of the world, the wrecking and ruin of her country and the plunging of millions into a state of hopeless misery, makes of her as much an instrument of Moscow as though she was an integral part of the Soviet system of Socialist republics. The prolongation of conditions which close the markets of China to the manufacturing nations of the world and intensifies the present unemployment problem abroad, only serves to advance the cause of World Revolution. China is already overrun with Communist bands and armies who, taking advantage of the weakness of the Government, are extending their activities and consolidating their hold upon whole provinces and districts from where they can be dislodged only by a decisive battle. Defeat of either the main North or South armies now struggling for the ascendancy, will strengthen and hearten the Communist leaders to further excesses. The situation is grave. The menace cannot be lightly set aside.

Stability and peace in China with a revival of the purchasing power of its people and the credit of its Government, will help to solve the problem of world unemployment and bring happiness and a full dinner-pail to millions of human beings. The drift of world-opinion is unmistakable. The collapse of Nanking, the triumph of Communism in this country, will affect the whole world. These facts are being slowly grasped and when the influence of "Big Business," "International Finance," "Capitalism," if you will, is brought to bear on their respective Governments, there will be no hesitancy when it comes to the choice between Communism and demanding that China put her house in order.

G.B.R.

# In the Name of Humanity!

Help the Starving Millions of Northwest China! We Did it in Belgium; We Can do it in China

THE recent action of the Connecticut State Board of Public Welfare in refusing to renew the license of the China Child Welfare, Inc., and the China Famine Relief, Inc., to collect funds in Connecticut, invites attention to a situation that has contributed largely to the present lack of American interest in Chinese affairs.

Americans are noted for their charity and willingness to contribute generously to any worthy cause, but when one drive follows another for the collection of millions to carry on evangelical, educational, famine relief or welfare work in any one country, there comes a time when the authorities must scrutinize carefully the activities of organizations incorporated to collect these funds. Hardly a year passes, without a new appeal to finance some meritorious object in China. For many years, these solicitations were confined to the raising of funds to maintain Christian missions in this country. Later on, as the purely evangelical aspect of missionary endeavor was modified and concentrated along educational and medical lines, came appeals for the millions to build and endow hospitals, universities, colleges and schools, which, by the very nature of their work, calls for a steadily increasing annual budget. As long as these institutions remained under Christian direction, these additional funds were not difficult to obtain. Under a new régime hostile to foreign interference in the educational system of the country and a determination to nationalize all schools created and directed by foreigners, American interest in these matters has undergone a radical change.

In addition to these drives to advance religious, educational and welfare activities has been the constant appeals for famine relief. These cries for help finally moved the President of the United States to dispatch a special commission of experts to investigate and report on the causes of the famine and suggest remedies that could be applied by the American Red Cross. With all sympathy for the Chinese people and their present unfortunate plight, the American Red Cross was convinced that under prevailing conditions it would be unwise and futile to ask the American people to contribute a great relief fund which could not be utilized if collected.

The general poverty of the people, lack of rainfall and other natural causes have admittedly contributed to intensify the present situation in the northwestern province, but behind these stands the long-drawn out political disorders that have made impossible any effort of the people to save themselves. The indictment of China's war-lords contained in this Red Cross report lays the responsibility for the present calamity squarely upon the shoulders of those generals whose ruthless exploitation of a poverty-stricken people, have doomed millions to a lingering death by starvation.

The stories which come from the famine zone are heart-rending. Whole villages are reported to be wiped out with the dead unburied because none are left with strength sufficient to dig graves. Two millions have died since the autumn of 1928. Women and young girls are being sold for a few dollars each and the procurers of China are filling the dives of the larger cities with their victims. Over 18,000 young Shensi girls are reported to have been sold in Manchuria alone. Cannibalism has appeared. In Sianfu, the capital of Shensi, the burial squads make their rounds twice a day. Food is to be had but at ten times its normal value. The population of over 5,000,000 needs about 4,000 tons of food daily and the new crop will yield about 200,000 tons or 50 days' supply. Against this colossal need, only 2,000 tons of grain have been moved into the famine districts by the Relief Committee. Thousands are doomed to die unless some way can be found to send food into the province.

That such an appalling situation can exist without any prospect of relief, is a sad commentary on our boasted modern civilization; a damning arraignment of policies which by permitting the Chinese to solve their problems in their own way without assistance, have condemned millions of unfortunates to death. The American people went to war with Spain when the reconcentration policy of Weyler brought starvation to thousands of Cuban non-combatants. In the past decade, untold millions of peaceful,

industrious, lovable Chinese farmers and villagers have been sacrificed to a system of tyranny and misrule that in any other country would have forced Western civilization to intervene in the name of HUMANITY. In no other country of the world would the civilized Powers tolerate conditions which have transformed whole provinces of China into vast cemeteries. It is not enough to say that it is up to the Chinese to settle their differences in their own way; to remain passive and neutral while millions of fellow beings are slowly perishing of starvation; it is not enough to remain a silent onlooker, and make no effort to save these unfortunates. If the reports from this stricken area are true—and they are true—then it is futile to waste time in acrimonious discussions as to who is responsible for the calamity. It is easy enough to fix the blame on Marshal Feng or Marshal Yen or to accept the Peking viewpoint that Nanking is culpable and then wash our hands of the matter while millions of despairing people mutely stretch out their arms to Heaven for a help that is withheld because a free-booting war-lord or two stands in the way of their deliverance.

We brought help and deliverances to Belgium when the country was invaded and occupied by the German armies. When the fate of a heroic Christian people was at stake we quickly found the way to break through red tape and come to their assistance. We poured millions into Belgium and induced the Germans to co-operate with us in this great humanitarian task of saving a people from starvation, even when the German people were equally suffering from a lack of food. Yet, for fear that we might incur the displeasure or hostility of a group of petty bandit generals, the great Christian nations of the world refuse to exercise their power to save the lives of millions of human beings in China.

Woe to Nanking! Woe to all who influenced the writing of the American Red Cross Report! thunders the official apologist for the Northern Military Oligarchy in the columns of his Peking daily. He proceeds:

"The Society that distinguished itself so mightily in the World War under President Hoover's field leadership by succouring untold millions in Europe, has failed miserably in China. Advised by men of no vision, blind to the bounteous fruit that awaited the helping hand, it turned away and left the unfortunate to die. The blot on its escutcheon should be erased,—it is not too late to do that even now. Civil war will leave fresh wounds which must be healed,—there will be fresh ravages to repair. The Cross, if it means anything at all, means succour to the distressed, irrespective of causes or of what has contributed to the distress. America of all countries is in a position to give bountifully: even Congress might have voted a great wheat fund of twenty-five million gold dollars had not men who should have known better—notably Mr. MacMurray, late American Minister to China—thrown their weight against it.

"There is time to repair the great error committed, time to do something great. When the present war is fought to its inevitable conclusion, there will be a fresh wave of suffering to attend to, fresh hordes of miseries. To withhold help when there is such a call will be to deny the principles on which Red Cross Associations were founded throughout the world."

We have no quarrel with this presentation of a situation that merits immediate attention. But it is well to bear in mind the other side of the story. Relief may come—it cannot come too quickly—but when the present war is terminated through the usual Chinese methods of compromise, and Feng and Yen retire once more to their Northwest fastnesses, the same old system of grinding down an impoverished people with crushing taxation, will begin all over again, in order to build up another army to hold these provinces as feudal dependencies. Unless there is some assurance that these northern armies are to be disbanded and their arms handed over to Nanking, a huge American relief contribution would only serve to quickly restore prosperity to these provinces and enable the war-lords to prepare for the next conflict.

It is well for critics to remember that the American Red Cross Society is a semi-official institution. Wherever it goes on its errand of mercy, it carries with it the diplomatic, and, if necessary, the armed protection of the American Government. Three years ago, at the height of the crisis in the Yangtze Valley, the American missionary, educational and philanthropic bodies came together as a unit to bring pressure to bear upon President Coolidge and Secretary Kellogg to withdraw our warships and armed forces from China, evacuate all American citizens and surrender our treaty

rights in order to gain the good-will of the Nationalist régime. When it came to the protection of American traders and their vested interests in this country, the uplift element was quite willing to sacrifice the interests of their fellow-countrymen.

At that time a famine was raging in Shantung and Southern Chihli and efforts were being made to send relief from the United States. The same organizations who were loudest in opposing the Government's policy to protect American lives and properties when it concerned the vested interests of their fellow nationals in Shanghai, led the campaign to have the American Red Cross send relief into the famine-stricken districts of Shantung and Chihli, at that time resounding to the tramp of marching and contending armies. They overlooked that the American Red Cross could not be sent into these regions without a guarantee of full protection by the American armed forces in China. Under the conditions which then prevailed, and still exist, no large group of American relief workers could carry out their mission of mercy without being subjected to the interference of the military leaders and their supplies confiscated for the use of the armies. In making its decision, the American Government, with all these facts before it, could not risk being called upon to protect the lives of its Red Cross workers or to assume responsibility of seeing that the funds so charitably contributed by the American people, would reach the starving people in the shape of grain. The murder of one American Red Cross worker engaged on such a mission, would enrage the American people to the point of demanding immediate intervention to put an end to such intolerable conditions. To avoid any such contingency, the American Government very wisely declined to permit its official relief organization to enter China. The efforts to influence a change of policy, led President Hoover to send to China his own commission to report impartially on the facts.

The Red Cross report may be open to fair criticism. Its decision may be contrary to all precepts and concepts of Charity and Humanitarianism, but like the Strawn Report, it will stand as an accurate description of conditions in this country; an indictment of a system of evil government that has condemned millions of people to degradation, starvation and death, without being able to voice their wrongs or lift a hand to defend themselves.

There is no blot on the escutcheon of the American Red Cross. The American people stand behind this instrument of their charity. If the Red Cross comes to China, there must be an absolute guarantee that it will be permitted to carry out its mission of mercy without interference. Who will give these guarantees? Obviously, Nanking is powerless to provide protection in territories ruled over by its bitterest enemies? Will Yen or Feng assent to an armistice and hand over their railways, motor trucks and other transportation to facilitate the rapid movement of the vast stores of food required to save their fellow countrymen from starvation?

There is one way that relief can be brought promptly to these starving millions. Immediate action and co-operation all along the

line is necessary. Hostilities must cease at once in the Yellow River region. A truce must be declared and an appeal made direct to the American Government for an assistance that it could no longer withhold. But guarantees that the food will reach the starving people must be forthcoming. The Port of Haichow and the Lung-Hai Railway should be handed over to Americans for operation during the period of relief. The military trucks and other transport now cluttering the roads with army supplies must also be turned over to facilitate distribution beyond the railhead. The fullest and heartiest co-operation must be extended to this Commission if the American people are to answer the call for help. Unless our conception of President Hoover's attitude towards this question is all wrong, he will insist as a basic condition, the immediate disbandment of the armies whose unchecked depredations and exactions have brought this calamity upon the people of Northwest China.

Two million people have died of starvation since 1928! Another million will die this year! No help can reach them unless pressure is brought to bear from the outside to open up a way. It was done in Belgium in the face of great difficulties; it can be done in China. No Chinese Government would dare to oppose or reject any honorable conditions upon which relief can be rushed quickly to their dying people. No faithful and true disciple of Dr. Sun Yat-sen could declaim against such humanitarian and friendly intervention as a violation of China's sovereignty. Sun Yat-sen loved the people, the workers, the farmers, the oppressed classes. Their welfare was his highest aim. Their loyalty and love assured the triumph of his ideals and the success of the Nationalist arms. The Nanking régime cannot escape the legacy that its Leader has bequeathed to them. No Nationalist official could openly oppose any plan of immediate relief, without betraying their leader. Opposition can come only from the North; from the chiefs whose rabble armies hold the transportation lines, the mountain passes and other vias of communication and refuse to loosen their hold over their terror-stricken prey.

It is up to Marshal Feng, to Marshal Yen and the Grey Bandit Hordes who hold the hinterland, as to whether the lives of millions of their fellow countrymen are to be saved through outside charity. Americans need no lesson in principles from the apologists of a system that has brought this calamity upon Northwest China. Americans have never closed their ears or their purses to appeals for succor, even from their enemies. All that we insist upon is that the food and grain reach the sufferers and that the Chinese contribute their share towards saving their own people, if not by funds, then by a remission of taxes, of transportation and other charges, and a guarantee that the relief workers will not be molested or subjected to outrage. Let the Northern Chinese war-lords show that they are worthy of American help and it will be forthcoming so quickly that it will make their heads swim.

G.B.R.

## American School in China

It Needs a Million Dollar Endowment. Help It!

As noted in the foregoing article, two distinct drives are now being conducted in the United States for Famine Relief and Child Welfare Work amongst the Chinese. There are other fund-raising campaigns for educational and other activities for the uplift of the Chinese. There is also a campaign for raising funds to provide educational facilities for the children of Americans residing in China.

As far back as 1912, a small group of Americans founded their own school in Shanghai in order that their children would receive proper education. Before that, they faced the dilemma of sending their children to the United States with the breaking up of home ties, or placing them in the British or French schools in China. American missionaries conducted a school in Chefoo, but it was rarely that the children of traders or business men were accepted. The school was always full.

About 1920, additional funds were successfully raised to purchase a piece of land in the French Concession and to erect a group of modern school buildings, which stand to-day as models of their kind in this country. It is well to emphasize in parenthesis, that

the American School is located within the limits and under the jurisdiction of the French Concession, for the reason that the American Government has in the past refused to accept any territorial concession that might conflict with China's sovereignty. The French Concession adjoins the Chinese City and those districts where disorders and anti-foreign agitations are rife. The American School is located on the very edge of this danger zone. Over five hundred American children daily attend this school, and if their Government were to withdraw its armed forces from Shanghai, the protection of these young Americans, would devolve upon the French authorities, who have their own citizens and children to defend.

The funds raised for maintaining this school failed to take into consideration the rapid increase of enrollment from 30 to the present attendance of 550. The standing of the school is high; its graduates being accepted by the leading colleges and universities in America without examination. The children retain their Americanism and make useful citizens. Its teachers are a devoted band, but as the

(Continued on page 279).

# Extraterritoriality and Chinese Propaganda

## The American Government's Attitude

**A**RE conditions in China misrepresented by foreign newspaper correspondents? Is it possible to faithfully report current events in this country without referring to conditions with which all the world is familiar? Can any presentation of the facts concerning the famine in the Northwest mitigate the impartial verdict of the special American Red Cross Commission as to the causes of this calamity? Can any suppression or distortion of the news permanently conceal from the world that the interior of China is overrun with bandit and Communist armies who levy tribute on the countryside, attack, lay waste and burn whole villages, towns and cities and put their inhabitants to the sword? Is it possible in the face of irrefutable evidence to deny the existence of pirates who infest the bays, rivers and creeks and attack Chinese and Foreign shipping alike? Is it possible to deny the existence of kidnappers, of slavers, of an opium traffic which finances whole provinces and for whose control wars have been fought? Is it possible to conceal the fact from foreign bondholders that the railways of China have been seized by local war-lords and operated for their own benefit? But why go on? There is hardly any single phase of actual Chinese conditions which can be accurately reported so as to create a feeling of confidence in the country.

On the other hand, it can truthfully be stated that the Nationalist Government, despite all its shortcomings, has made remarkable progress. It deserves great credit, sympathetic support and the highest commendation for what has been accomplished to date. No other single government during the past two decades has done more to better conditions in China and merit the respect of other countries, than the Nationalist régime. Foreign newspaper correspondents have generously conceded a full measure of praise for what has been accomplished and this attitude has also been reflected in the policies of their various governments towards Nanking.

Honest reporting and frank criticism of current Chinese events on the part of foreign newspapers is not inspired by unfriendliness towards the Nanking Government. It is natural, however, that press correspondents stationed in Peking or Mukden will be influenced by an environment not always sympathetic towards Nanking. The outside world demands the news from all angles in order to gather a correct idea of what is transpiring in this country. If we accept the Chinese *apologia* that their recurring civil wars are merely their way of deciding elections, then the whole picture is reduced to a simple reporting of Chinese politics, in which a military victory represents so many votes cast in favor of the winning general. The press of the world is not unfriendly to the Nationalist régime, for it realizes that Nanking cannot control banditry, suppress piracy, relieve famine, guarantee law and order and carry out constructive programs when it must constantly fight for its life against political rivals whose opposition keeps the country in a constant state of civil warfare. Sympathy is one thing. That Nanking undoubtedly has. Reporting the facts is another thing. If Nanking hopes to retain the sympathy of the outside world, it will not attempt to penalize those who report the facts and comment upon them fearlessly and honestly.

We might go further and state that many phases of the Nationalist program have not received all the favorable publicity that would have been cheerfully accorded had the facts been accessible. The Chinese conception of publicity and propaganda seems to be confined to either domestic or international affairs and their fight for equality. The outside world is not concerned with their domestic squabbles, but it is interested in anything that affects foreign interests or that makes for better trade conditions and the restoration of the nation's credit.

The following *Kuo Min News* report would indicate that some of our Chinese friends labor under the delusion that the press of the world is misinformed as to actual conditions in China:

"To facilitate the circulation of accurate news reports concerning China as well as to supply the press in China with foreign news and comments in regard to Chinese affairs, the Foreign Relations Discussion Committee at

its meeting yesterday decided to petition the Ministry of Foreign Affairs to open news-gathering organs and publish Chinese-owned newspapers in the capitals or other important cities in various foreign countries.

"It was pointed out at the meeting that often misleading news reports are despatched to foreign countries by foreign news agencies and newspaper correspondents in China resulting in the creation of a wrong impression concerning China in foreign countries, which should be rectified as soon as possible so as to promote mutual understanding between Chinese and foreign peoples."

Ten years ago, the Chinese were able to sway the emotions and sympathy of the outside world, at a time when their cause was sponsored by highly placed American and British officials and directed by expert foreign propagandists who controlled the news services of the country. This campaign very nearly precipitated hostilities in the Pacific between two friendly nations and created suspicions which has taken ten years of hard, up-hill diplomacy and far-sighted statesmanship to dispel. As the truth was slowly grasped by American editors, they determined that never again would they be victimized in this manner. The leading American news services and newspapers now maintain their own staff correspondents in Tokyo, Peking, Shanghai, Hongkong and other Far Eastern news centers. It is no longer possible for any correspondent to act as a propagandist or special pleader for any Chinese faction or war-lord, without inviting exposure by checking his reports with those of his colleagues.

The advocates of news suppression overlook that the legations, consulates, army and navy intelligence officers, the commercial attachés and trade commissioners scattered throughout the various treaty ports of China, report daily and impartially to their governments the truth about conditions in their respective districts. The thousands of missionaries stationed in the inland cities and villages of China report to their boards in Shanghai, New York, London or elsewhere, as the case may be. Every prominent newspaper in the United States maintains a Washington bureau and if the news about China be suppressed at its source, it will leak out or be given out officially and in such a manner that it will carry ten times more weight than if it came from the newspaper correspondents on the ground.

Misleading news reports about China have undoubtedly been disseminated this last year and in the very nature of things will continue to be sent out of the country. Much of this confusion is traceable to the conflicting propaganda circulated from every provincial capital in the country. When the Chinese authorities attempt to muzzle the press, deport correspondents of leading foreign newspapers or close the mails to local newspapers for frank and honest criticism of their policies, they automatically close the door to their own propaganda. Mussolini tried it in Italy and the American newspaper editors ordered their correspondents out of the country. It would be the same in China. No foreign newspaperman could hold his job if he accepted at its face value all the official propaganda disseminated by the various factions and war-lords of China.

No Chinese newspaper published in the capitals or other important cities of the world for the avowed purpose of supplying accurate news about this country, could exist without heavy subsidies and no foreign editor would print its propaganda as long as he is well served by his own correspondent on the ground or can obtain reliable news from his own government officials. Just now the interest of the Chinese people is centered on their own affairs. Foreigners are not particularly concerned in the outcome of their constantly recurring civil wars. Their one hope and desire is to see a stable government functioning that can uphold law and order, dispense justice, promote trade and live up to its treaty obligations. They are willing to make any reasonable sacrifice to assist the Chinese people to reach this goal.

On the other hand, foreign nations holding treaty relations with China are vitally interested in the problems of extraterritoriality and the future of the concessions where they reside and do business. Without exception, their governments are willing to accept the Chinese viewpoint just as soon as internal conditions warrant this surrender of treaty rights. All foreigners, of whatever

nationality, who still enjoy extraterritorial privileges, will oppose any impairment of these safeguards until a Chinese Government is evolved out of the present chaos strong enough to enforce respect for its mandates and extend protection to foreign lives and properties at least, within the limits of certain well defined areas.

As far as all other matters are concerned, the Chinese people have the full sympathy of the press of the world. No Chinese Government has received such warm, whole-hearted support from foreign newspapers than the present Nationalist régime at Nanking. From all sides, from Japan, from America, from Great Britain and other interested Powers, there has been only patience, tolerance, forbearance and hope in dealing with Nanking. Every honorable sacrifice has been made by these Powers in order to strengthen the Nationalist Government so that it might consolidate its rule over the whole country and hasten the day when China's full sovereignty could be recognized.

In effect, extraterritoriality is the only important issue affecting the relations between China and the principal foreign Powers. The abolition of these rights and surrender of the concessions will become a fact just as soon as the Chinese Government can satisfy the Powers of its ability to take over these responsibilities. No amount of propaganda can hasten the settlement of such a momentous problem. Only performance can create confidence in the intentions and ability of the Chinese to assume these obligations. The Chinese Foreign Relations Committee in advocating the establishment of official Chinese propaganda organs abroad, should read carefully the announcement recently communicated to all American citizens by the American Consul General on the attitude of the Department of State in regard to American extraterritorial rights in China. It follows:

"In view of apparent uncertainty and some misapprehension on the part of American citizens with regard to the present legal status of American nationals resident in China, you are informed that the Department of State does not regard the action taken by the Chinese Government on December 28 and 30, 1929, as having altered the legal status of American citizens in China."

"The question of gradual relinquishment by the United States of rights of extraterritorial jurisdiction in China is at present a subject of study between the two Governments. As yet no agreement has been arrived at; there has been no surrender by the American Government to the Chinese Government of the former's rights of jurisdiction over American citizens in China or of the rights of American citizens under the treaties in China. It is apparent that enjoyment of these rights is not in all cases insisted upon and that various American nationals or American organizations have in a number of cases and on various grounds refrained from availing themselves of their rights. However, in point of law these rights remain unimpaired and as heretofore American citizens in China in all cases in which they are defendants continue to be subject exclusively to the jurisdiction of American courts administering the applicable laws of the United States."

"In the event that Chinese authorities attempt to take jurisdiction over an American citizen notification should be made immediately to the American consular officer for the district in which such attempt is made in order that appropriate action may be taken by the American consular officer concerned."

A mutual understanding between Chinese and foreigners will be greatly facilitated by a recognition of these facts. There can be no objection if the Chinese Government wastes its money to subsidize or establish newspapers in foreign capitals so long as the dissemination of news is confined to purely Chinese political affairs or such legitimate information as will assist in the development of the country, but when this official propaganda is directed towards influencing the immediate abolition of the treaty safeguards which guarantee protection and the equitable administration of justice to foreigners resident in China, the Chinese must expect that every effort will be made to present the other side of the case.

The Chinese are apparently not well informed of the American official attitude towards foreign propaganda to influence American governmental policies. They should read the address delivered two years ago by President Coolidge at the formal opening of the new National Press Club in Washington.

## Adding Insult to Injury

AN interesting sidelight on the methods of conducting business in China is contained in the new set of regulations of the Shansi Purchasing Bureau for the supply of machinery and materials to the Government of Marshal Yen Shih-shan. It is the same old trick familiar to American and European exporters who learned their lesson in South American countries when there was no guarantee that the last payment would be made, once the machinery or plant was delivered and installed. The only assurance the seller had that he would be paid for materials sold, was to arrange for payments in three installments; one third with the signing of the order, one third on presentation of shipping documents and the last third when the plant was installed and in operation. The first two payments covered costs and a small profit, so that in the event the last payment was defaulted, there would still be a margin of profit on the deal. The Latin Americans had to pay nearly forty per cent. as a penalty for dishonesty. The Shansi regulations as described by Reuters', offer the following terms to firms supplying materials for the Taiyuan arsenal:

- 1.—Payment is to be made in three equal instalments.
- 2.—The last instalment is to be paid six weeks after delivery in Tientsin, but for special machinery, etc., this period is to be extended to eight weeks.
- 3.—Suitability of the machines, full supply of necessary attachments, etc., must be guaranteed by an approved bank, in case erection cannot be completed within the period of eight weeks, referred to under (2) above. If a suitable guarantee cannot be offered, the last payment is to be held by the Purchasing Bureau as security, to be paid only after complete erection and trial.
- 4.—In the event of late delivery, the seller is to forfeit 2 per cent. of the total contract price for the first two weeks and

thereafter  $\frac{1}{2}$  per cent. of the total value per week. For stock goods — presumably China stocks—these terms are 2 per cent. for the first week and  $\frac{1}{2}$  per cent. per five days.

5.—The payment referred to under (2) may be deferred when delivery cannot be taken by the purchaser due to a disturbed political situation or to lack of facilities for transportation.

"The majority of foreign firms trading with the interior are understood to consider these terms rather one-sided. No bank guarantee is offered by the purchaser for the last payment and the futility of the seller attempting to give a suitable guarantee under (3) is apparent. The purchaser will take delivery in Tientsin, arrange transportation to Taiyuanfu and then hold the seller responsible for the full supply of necessary attachments and completion of the machines generally.

The answer of foreign firms to this is that the method has been tried. Machinery delivered years ago is still awaiting erection and visitors to the Taiyuanfu Arsenal have seen machine attachments where they were carelessly thrown down, half buried under earth thrown up from excavations for the foundations of new buildings. In certain instances, machines taken over in Tientsin and signed for by a representative of the Shansi Government have not reached Taiyuanfu, and therefore payment has never been made.

It is pointed out that in most countries "after erection and trial" has a very definite meaning. The manufacturer is given facilities to do the work and he does not hand over until after a satisfactory test, but such conditions cannot clearly obtain in most parts of China at present and there is therefore considerable room for fear as to what may happen in a test carried out by the seller when a large final payment depends upon the result.

As regards (5) above, it is stated that certain firms have had material and machinery lying in Tientsin for years.

Business conditions in the interior of the country have become increasingly difficult during the past few years and many firms declare that it is futile to try to obtain last payments in full once the goods have left their hands."

The Nationalist régime at Nanking fell heir to debts aggregating \$70,000,000 incurred by the Northern War-lords for railway equipment alone. Life is too short to make even an approximate estimate of the millions of bad commercial debts that have been piled up in excess of the railway obligations. The cars, locomotives, rails and other materials to the value mentioned above, were delivered, set up, and placed in operation, in full confidence that the then recognized Chinese Government would honestly and in good faith make the payments as stipulated in the contracts. The foreign manufacturers and their agents in China lived faithfully up to their end of the contract but the Chinese refused to pay. These debts are still outstanding. Over half the amount is owing to

American manufacturers. The Nanking Government on its recognition by the other Powers, assumed responsibility for the settlement of these debts, but Marshal Yen Shih-shan and his Northern associates have the equipment and enjoy the revenues from its operation.

In the welter of propaganda surrounding the present civil war in China, the publicity agents of Marshal Yen accuse Nanking of floating huge loans secured on the revenues of the provinces under Nationalist control. Whether these loans are illegal, unnecessary, or otherwise, they have been readily taken up by the Chinese public and so far the bondholders are not complaining. Nanking has endeavored to meet its obligations and has been compelled to pay cash for materials as a penalty for the repudiation or failure of the Northern military Governments to pay their honest debts.

If any guarantees are required for conducting business with Peking or Taiyuanfu, they should be given by Yen Shih-shan. The recent regulations of the Shansi Purchasing Bureau add insult to injury.

## Central Asian Development

### Economic and Political Aspects of the Tur-Sib and Afghan Railways

THE Soviet's new Turkestan-Siberian Railway from Semipalatinsk to Aris in Uzbekistan, parallels the Chinese frontier for a distance of about 700 miles. It is easy enough to read into this a menace to China's sovereignty over her Far Western border-lands. All railways that terminate on or parallel the frontiers of a neighboring state are potentially strategic but there are times when their military significance becomes secondary to the transportation needs of the territory traversed. We prefer to believe that the economic necessities of the Soviet Union are responsible for the construction of this 1,700 mile railway, which stands as one of the most remarkable transportation achievements in the annals of railway building. The road (with the exception of the rails which came from Sweden), is a purely Russian accomplishment and cost over \$100,000,000.

Its strategic menace is obvious and it is always possible that it may be used to exert pressure upon China in any serious diplomatic crisis. The old Czarist régime applied a very rigid and highly provocative policy towards China in the matter of railways; emphatically enunciated on various occasions when China attempted to exercise her sovereign rights in building new lines within her own territory that terminated on or near her Siberian borders. Russia's protest against the Chinchow-Aigun railway asserted that the line was a menace to her strategic position on the Amur; a doctrine which applied with equal force to any other Chinese railway terminating on the Siberian frontier. Russia furthermore opposed the construction by China of any railway traversing Mongolia that would open up this territory to Chinese colonization; another basic Czarist doctrine just as clearly and brutally stated when the Chinese Government entered into a contract with an American firm for building a railway along the Yellow River within the confines of Inner Mongolia.

These policies, based upon Russia's determination to dominate China as the first step towards the invasion of India from the northeast, were brought within the realms of possibility by Li Hung-chang's stupid diplomacy in regard to Manchuria and the subsequent equally asinine attitude of Peking in conceding railway concessions to French and Belgian interests acting as Russia's agents. In effect, Russia reserved to herself the right to encircle China's frontiers with a net-work of strategic lines and criss-cross China Proper from North to South and East to West with trunk railways secretly designed for her subjugation. Russia's old program of "conquest by railway" by which she ruthlessly brought all of Central Asia under her domination and despoiled China of Manchuria, had for its main objective the invasion and conquest of India. Only her defeat by Japan in 1905 and the constant vigilance of the British Foreign Office and Legation at Peking in exacting compensatory railway concessions from China for the defense of the Yangtze region, prevented the realization of the Russo-Franco-Belgian program.

There is evidence that the Soviet has faithfully adhered to the traditional Muscovite policy towards India. The realization of this old dream is once more being facilitated by China's inability to discharge her international obligations. China's sovereignty over her Central Asian border regions is extremely tenuous. If we are to believe the testimony of travellers who have recently ventured into Chinese Turkestan from the Russian side, there is no law, order or guarantees for life and property. The Chinese officials in these border-lands, far removed from any central authority, are swashbuckling bandit chiefs who recognize no authority but their own. As far as Nanking, Peking, or any other regional government of China is concerned, Hsinking and the Kuldja region is as independent of the central authority as is Tibet or Outer Mongolia. Under such conditions, the old game of separating a weak nation from a slice of its territory is simplified. As the United States obtained control over the Canal Zone or as Russia subsequently brought Outer Mongolia under her influence, there is nothing that can now stop the Sovietizing of Hsinking and the Kuldja region if Moscow adheres to the traditional Muscovite program. Economically, these border districts come within the Soviet sphere. Their only outlet with the outside world, even with Peking, lies through Soviet territory. Should the Soviet close the Trans-Siberian and Tur-Sib Railways, China's only communication with her Far Western provinces would be along the old caravan routes, requiring at least three months of desert travelling. Automobiles might shorten this time, but it would not change the military situation.

Following the many precedents created by other Powers in protecting their special or regional interests in various parts of China Proper, there could be no reasonable objection against Moscow negotiating direct with the authorities at Kashgar, Kuldja, Kobdo or Urumchi for the settlement of purely local problems. This new railway outlet for the products of China's Far Western border-lands will bind them securely to the Soviet economic system and pave the way for the same political strategy so successfully worked in separating Outer Mongolia from direct Chinese rule.

If this constitutes a menace to China, it is difficult to see how it can be averted. For all practical purposes, Chinese Turkestan has been alienated from China by her own helplessness. The new railway does not therefore materially alter a situation that has existed for many years. When, if ever, Moscow decides that the time is ripe to separate Hsinking from the main body of China, the way will be so carefully prepared by economic considerations that China will be powerless to do more than protest. Only by completing the Lung-Hai railway to Lanchow and extending it westward across the deserts of the Kansu panhandle and the Great Caravan Road to Kashgar with a branch through Urumchi to Kuldja and Kobdo, can China hold this territory against the will of a people whose economic existence is linked with their Soviet neighbors.

It may be that Moscow, looking a long way into the future is carefully preparing the way for biting off another piece of Chinese pie. This may come and when and if it does, no other Power can effectively protest or come to China's assistance. The rest of the world will take exactly the same attitude as it has done towards Mongolia and Tibet. On paper, perhaps, the sovereignty of China over these regions may be recognized by foreign chancelleries and the Chinese Government held responsible for the protection of foreign lives and properties as she now is in Mongolia. But such recognition will end there.

Since 1898, China's sovereignty and territorial integrity has been more or less guaranteed by the Open Door Doctrine, a purely paper policy devised to protect China until she was able to defend herself. The Washington Treaties solidified this doctrine, as far as the signatory Powers were concerned, but Russia is not a signatory and therefore not committed to recognize its provisions. Naturally, the Soviet declares that the new Tur-Sib line implies no threat to China and here the matter must stand. If we are to read into all new Central Asian railway construction a menace to India or China, these regions will never be brought under cultivation or their resources added to the wealth of the world. The strategic significance of the line becomes subordinated to the transportation needs of the territory served.

If the Tur-Sib line constitutes a menace to China it becomes a far more formidable weapon for the furtherance of the Soviet's designs upon India. For many years British diplomacy, backed up with a determination to fight at the drop of the hat, has succeeded in maintaining Tibet and Afghanistan as buffer states between India and Russia, closing these lands to railway penetration from either side. This picture is now changed. King Nadir Shah of Afghanistan has recently confirmed the huge contracts entered into by his predecessor with a German firm for the construction and operation of a system of railways that will link Kabul with the Indian border at the Khyber Pass and with Herat and the Russian Central Asian system at Kushk, where for many years, the Russians had the rails and construction material stored ready to extend their military lines at a moment's notice to Herat.

This Afghan contract with a German firm provides for a line from Kabul to Jalalabad and from there to the Indian border. Another line will connect Kabul with Kandahar and thence northwards to Herat. A further link will connect Herat with Kushk, the rail-head of Russia's Central Asian System. Central Europe will then be joined by rail with Central Asia, permitting a through rail service from Calais to India. It is understood that the contract is in the nature of a franchise, under whose provisions the German Company will furnish the capital, build and operate the lines, and pay the Afghan Government a royalty on the proceeds. Twenty years ago, such a contract would have invited the immediate protest of the British Government and the mobilization of armed forces to compel its cancellation. To-day, even with the certain prospects of further complicating the already grave situation in India Downing Street cannot fairly oppose the construction of a railway whose civilizing effect upon the fierce tribes of Afghanistan and the opening of this hitherto forbidden country to world commerce, will counterbalance its strategic possibilities. New markets for manufactured products will be created and an outlet found for many much needed raw materials.

These new Central Asian railways open up tremendous possibilities for the commercial exploitation of Turkestan. Coincident with the opening of the Tur-Sib line comes the announcement that the Soviet Government is negotiating with American engineers for the technical direction of one of the largest irrigation and reclamation schemes in the world. If these negotiations succeed, several hundred American specialists will undertake the stupendous task of bringing over a million acres in Turkestan under cotton cultivation by the spring of 1933. The estimates contemplate the initial expenditure of Gold \$65,000,000.

The land to be reclaimed and brought under cultivation by diverting the Syr-Daria River is exceptionally fertile. The irrigation scheme calls for digging a main canal some 84 miles in length with the necessary branches to properly distribute the water over this million acres of soil, whose fertility reaches down for hundreds of feet. The American contract calls for the purchase of many huge dredging machines and other equipment that will finish the job, working night and day, in 30 months' time. As an indication of the size of this undertaking, it is pointed out that during the last 25 years, the American Government has spent some \$200,000,000 for irrigation, whereas the Soviet will spend more than that in the

next few years for reclaiming the deserts of Turkestan. It is intended to plant this reclaimed area to long staple cotton, and carry out the entire farming process with machinery. It will also be necessary to colonize the region on a large scale, transporting families from the poorer districts of Russia and giving them a new outlook on life in this wonderful land of opportunity. Irrigation, colonization, railway and highway construction are being carried on simultaneously, and it is hoped to be able to plant the first large cotton crop in 1933. The Soviet program also includes the erection of large cotton mills in this region as soon as the raw material is assured, in order to supply the home markets and those of Central Asia with textiles.

Unlike the many gigantic Chinese development projects which can be realized only through the floating of huge foreign loans (an impossibility under present unstable political conditions) the Soviet, notwithstanding their repudiation of old debts and inability to raise new loans, are able to finance these schemes from their own revenues and to obtain commercial credits from America for equipment and technical supervision. What effect all this rapid development of Central Asia will have on the international political situation, time alone can tell. As far as China is concerned, it can only tend to bring her Far Western border-lands more and more under the Soviet economic system and alienate the people of Hsinking and Zungaria from a lip-service allegiance to a government that, up to the present, has done nothing to better their poverty-stricken condition. A strategic menace to China may lurk behind this new Tur-Sib Railway, but the real menace lies in the possible casting off of a political tie that brings no reciprocal advantages for participation in a political system, that whatever its faults, offers a new life, a new outlook and real prosperity to the people of these backward regions.

In the short space of five years, the Soviet has opened up a brilliant future for these medieval Central Asian communities. We may condemn the system and denounce the Soviet political, religious and economic propaganda, but we cannot close our eyes to facts. Within another decade, the political map of Central Asia will undergo another transformation. The completion of the Afghan railways and their connection with the Central Asian and Indian systems, will revive the old struggle for the mastery of India. China lies helpless, torn asunder by internecine strife and with no leader or statesman capable of staving off the inevitable. China can do nothing but bargain to preserve a semblance of sovereignty in Hsinking. The needs of a rich territory and the demand for more markets for the world's manufactured products will offset any protest or opposition on the part of Great Britain to the consummation of the Soviet-Afghan projects. The Soviet will eventually triumph in Central Asia. History will repeat itself. Once again, China's weakness and inability to discharge her international obligations and protect her territorial integrity will open the way for Russia to realize her ages-old dream of a warm-water outlet on the Pacific or Indian Oceans.

G.B.R.

## American School in China

(Continued from page 275).

school receives no public monies and relies largely on its low tuition fees, the staff is ill-paid. The school as it stands to-day is far from being completed. It requires more buildings the erection of a fence and other safeguards for the proper protection of the little children entrusted to its care. Lack of these rudimentary guarantees have influenced otherwise loyal friends of the school to place their children in other institutions. The school needs an endowment of at least \$2,750,000 to enable it pay decent salaries to its principal and staff, to erect new buildings and provide those safeguards that seem imperative to parents during this period of lawlessness in the International Settlement.

It is seeking to raise in America \$1,000,000 of this amount at the present time. American prestige in China cannot be unaffected by the conditions existing in an American school conducted under such conditions. The American School urgently needs this assistance and Americans in China, nearly all on a salary basis, look to their principals at Home and to those who have the best interests of their country at heart, to subscribe to the fund now being raised by a committee whose headquarters are located at 17 East Forty-Second Street, New York.

# Nanking and the Shanghai Telephones

**W**HEN the Directors of the Shanghai Mutual Telephone Company, Ltd., recommended on May 28, the acceptance of the I.T. & T. tender for the purchase of their property and franchise, the Chinese started an agitation for the "restoration of sovereign rights" and the incorporation of the Shanghai telephones into their own state system of communications. From the Chinese viewpoint—admittedly a reasonable one—their wishes should have been ascertained as to disposal of a property whose proposed forty year franchise extension will legalize its activities long after the International Settlement has been surrendered to their authority. On the other hand there seems to be no good reason why the Chinese Government should not have made known its attitude at an earlier date, or, if its intention to purchase the Telephone Company is serious, it could easily have submitted its own tender for the property. The agitation culminated on June 12, by the Ministry of Foreign Affairs issuing the following statement:—

"It is reported that the authorities of the International Settlement and the French Concession in Shanghai have invited tenders for the purchase of the Shanghai Mutual Telephone Company, Limited. Among the terms to be given the successful Tender are a Franchise for forty years and an increase in the Telephone Tariff. It is further reported that the Advisory Committee appointed by the Shanghai Mutual Telephone Company has recommended to the Settlement Authorities the acceptance of the International Telephone and Telegraph Corporation's tender, and awaits the submission of the tenders and recommendations to the general Shareholders' meeting of the Telephone Company for final decision, the sale of the Shanghai Mutual Telephone Company with great concern. In view of the fact that in the said Company the Chinese own over sixty per cent. of all the shares, the sale of the Company to a foreign corporation is tantamount to the transfer of a Chinese enterprise to foreigners. At a moment when the Chinese people are striving to regain their lost privileges, such a step is apparently opposed to the trend of the times. The proposed increase in the Tariff will affect Chinese more than foreigners inasmuch as the number of Chinese subscribers far exceeds that of foreigners. On the basis of the International Telephone and Telegraph Corporation's estimate of profit on its investment, namely, ten and a half per cent., the present tariff will be increased by thirty-five per cent. This extra burden will have to be borne mainly by the Chinese community. Finally, the grant of a forty-year franchise is without legal ground. The spirit of such a measure is evidently contrary to the policy of Government ownership of Public Utilities. The acquisition of the telephone enterprises in the Tientsin and Hankow Concessions is a clear expression of this principle. Such a policy must be carried out because government enterprise takes into concern the welfare of the community while private-ownership aims at the making of profit.

"In view of the above-mentioned facts, the Chinese Government emphatically declares that it cannot recognize the sale of the Shanghai Mutual Telephone Company to any private concern. It is prepared to purchase the said Company at a fair price. The co-operation of the parties concerned is invited so that the present issue may find an amicable solution."

If Chinese share control of the Shanghai Mutual Telephone Company justifies Nanking in prematurely asserting its sovereign rights to interfere in the proposed sale of its property to the International Telegraph and Telephone Company, then it is equally justified in extending its authority over all other foreign registered companies in which Chinese capital predominates. If this right be recognized in so far as public utilities are concerned, it automatically extends to tramways, motor bus lines, gas, waterworks, shipping, and most any other profitable enterprise that the Government may arbitrarily classify as public service.

The Shanghai Mutual Telephone Company is a British enterprise, subject to the British liability company laws and until extrajurisdiction be abolished, under British jurisdiction. Since its registration, the activities of the company have been supervised by a board of directors, from which the names of Chinese have been prominent by their absence. If it is now true that over sixty per cent. of all its shares are held by Chinese, the inference is that these shares are held in trust by foreigners who vote the stock. If the Chinese majority shareholders are not satisfied with the conditions of the proposed sale of the property to the I.T. & T. they have the remedy in their own hand. They have only to come out into the open and vote their stock in conformity with the wishes of their Government and the deal falls through.

If this Chinese share control gives the Chinese Government the right to anticipate the abolition of extrajurisdiction and surrender of the International Settlement, it concedes to it the same authority over the activities of all other foreign registered companies operating in the Treaty Ports and Leased Territories and precipitates the major issue now confronting foreign vested interests in China.

If Chinese share control of a foreign registered company can be employed as justification for Nanking to exercise jurisdiction over its activities, then many other British registered China corporations and the majority of the American China Trade Act companies are equally liable to an interference that under present chaotic legal and political conditions, might easily lead to confiscation.

The real crux of the above statement of policy must be sought in the contention that the grant of a new forty year franchise to the Telephone Company is without legal ground and that the spirit of such a measure is contrary to the policy of Government ownership of public utilities. In other words, the Chinese Government stands pat on its declaration of January 1, that extrajurisdiction is now abolished, and emphatically refuses to admit the right of the Shanghai Municipal Council, to further exercise its juridical rights in disposing of any public utility enterprise to private control, or, where this control is now exercised by private capital, to prohibit any deal that may conflict with its ideas of ultimate state ownership. As in the case of the transfer of the Shanghai Municipal Electricity Plant to the Shanghai Power Company, Nanking declines to admit the legality of the transaction, holding over this American corporation the menace of confiscation or costly litigation in Chinese courts, as soon as the International Settlement is surrendered to Chinese control.

Nanking now holds the same threat over another American corporation whose bid for a private telephone property has been approved by the directors of the telephone company. Both of these American corporations are allied with the strongest financial groups in the United States. Their activities and holdings are world-wide. They typify the present American trend in world investment. Their influence in Wall Street is sufficient to assure the success or defeat of any financing for countries in which they are interested. Their influence in Washington will assure the support of the State Department to any legal and honorable transaction in which they may be involved abroad.

In refusing to recognize the validity of the transfer of the Shanghai Power plant and the Shanghai Telephone system to these American companies operating strictly within their legal and treaty rights, Nanking deliberately forces an issue with the American Government that can only react unfavorably upon any negotiations now taking place in Nanking or Washington for the early abolition of extrajurisdiction. On one hand, China is seeking the sympathy and support of American capital for the development of its transportation system and other important public undertakings, and on the other making it impossible for American capital to operate in the country. American investors are showing confidence in the future of China by taking a chance in the two principal public utility enterprises of Shanghai, where law, order, justice and protection is, for the present, guaranteed under existing treaties. If, the Chinese Government succeeds in exercising its sovereignty over the private property of the telephone company prior to the final settlement of the extrajurisdiction issue and illegalizes a transaction carried through in good-faith by the I.T. & T., it can hardly expect American investors to waste any further time in considering their many appeals for financial assistance.

## Book Notes

MINING OF ALLUVIAL DEPOSITS BY DREDGING AND HYDRAULICKING, By W. E. Thorne, M.I.M.M., and A. W. Hooke, M.I.M.M.—Published by: Mining Publications Ltd., 724, Salisbury House, London, E.C.2. Price 20s. net.

This valuable contribution to the mining of alluvial deposits by dredging and hydraulicking is of exceptional interest to Far Eastern mining engineers. Many dredges are at work in this part of the world; in the Amur River district, in Korea, in the Philippines, in Siam and Malaysia. In preparing their study of the subject, the authors have confined themselves largely to the practical side of the work met with in the exploration, prospecting and management of alluvial propositions and represent for the most part their own experience in all parts of the world.

Examples of working instances are given, illustrated with many drawings and photographs.

# The Kra Canal

## Shortening the Sea Distance between The Far East and Europe

IN the American vernacular, when the Siamese desire to "get Singapore's goat," they have only to talk about digging the Kra Canal. A Danish engineer in Bangkok recently expressed a keen interest in this project, probably with the idea of starting something that would bring the contract to Denmark. Siam is an interesting little country sandwiched in between the French and British dominions in Asia and preserved as an independent state largely by alert British diplomacy counteracting the old Franco-Russian program of ousting her from India from the east. Both Powers fear the ascendancy of the other in the affairs of the little kingdom, with the result that the Political Adviser to the King is invariably an American, while the important commercial concessions and big business has gravitated to the Danes, who own the electric light, tramways and cement factory in Bangkok and one of the largest trading and shipping concerns in the country. It is not to be wondered, that a Danish engineer should evince such a keen interest in a project, that if ever carried out with Siamese funds, will most likely be directed by an expert from Copenhagen.

The *Penang Gazette* commenting on the proposal, reminds its readers that the Kra Canal route was originally surveyed in 1843 by the Executive Engineers of the Tennasserim Province of Burma. For various reasons, largely political, the scheme was shelved, but it has cropped up at various times since to the intense annoyance of Singapore. There are no insuperable engineering difficulties in the way of digging the canal. Between the points surveyed the distance is only thirty-two miles. The route from West to East, enters the Pakchan River diverging into a small stream called the Kra, over the Kra Pass and thence into the waters of the Chinpohun which empties into the Gulf of Siam.

The differences between the distances from Calcutta and Ceylon *via* Singapore to Hongkong and *via* the proposed canal are interesting. From Ceylon to Hongkong by the present steamship route the distance is 3,040 miles; *via* Kra it is only 2,530 miles, while the distance from Calcutta to Hongkong *via* Singapore is 3,080 miles. The distance saved while not great, can scarcely be used as an argument against the cutting of the canal, the outstanding merit of which is that it will provide a more direct route to the Far East.

As long as London was the financial center of the world, no large loan could have been floated by the Siamese Government to carry through a project which menaces the strategic and commercial value of Singapore. However, the old pre-war international line-up which kept Downing Street and Calcutta always guessing what the Franco-Russian combination would do next, has disappeared. On the other hand, other equally important strategic considerations have entered into the picture. Singapore is now the center of the world's rubber empire, and although the old Russo-Franco nightmare no longer disturbs the slumbers of British statesmen, they have created another bugaboo to justify the establishment of a Far Eastern Gibraltar at Singapore. The digging of the Kra Canal which would divert the through sea traffic to the Far East from the Straits of Singapore, would so completely undermine the new British scheme of imperial defense, as to call forth the immediate opposition of the Lords of the Admiralty. If these political considerations are eliminated, the Kra Canal project is reduced to a simple commercial proposition, involving the question of whether or not the undertaking would pay a fair return on the investment. There could be no valid reasons advanced at this time for opposing the construction of the canal, if the Government of Siam has the funds or the credit to finance the contract. The only opposition could come from Singapore whose maritime importance would dwindle as through Far East traffic is diverted through the new cut. The development of aerial navigation, together with the construction of the canal across the Isthmus of Kra, will eventually reduce Singapore to a third rate port, completely isolated from the main world trade routes. The demands of world trade will in due course force the construction of a canal which lops off two days of ocean traffic between the Far East and Europe and the Far East and the markets of India and East Africa.

In addition to these larger world trade considerations in favor of the Kra Canal are the purely local Indo-Chinese interests clamoring

for any old route that will shorten the distance between Saigon and Paris. The French are not at all interested or concerned with the future of Singapore and keep urging their Siamese friends to give another twist to the Lion's tail by creating a port of call at Lomsak or some other convenient place on the West Coast of the Kra Isthmus, where the mail steamers can discharge passengers and mails. A branch line from the present East Coast Siamese Government Railway to the proposed port would provide quick connection with Bangkok and when the Siamese-Indo-China rail systems connect at Battombong, it would cut down the time from Hanoi to Paris about a week.

The whole idea would be a welcome one, providing a new and interesting change from the monotonous Hongkong, Singapore and Penang route to Europe. The mail steamers and tourist ships would be able to land their passengers at the port near Puket and pick them up again at Camranh (north of Saigon) or, *vice versa*. In this way, passengers would enjoy visits to Saigon, Pnom Penh, Angkor and Bangkok in passing from one port of call to the other. The advantages to Indo-China would be great while equal benefits would accrue to Siam. The port of call near Puket would save passengers and mail for Bangkok seven hours at sea as compared with Penang and ten hours less railway journey. The Siamese, while gladly acclaiming the new port and expressing a willingness to construct it and the branch railway to facilitate needs of travel, invite attention to the fact that it may be difficult to induce the steamship companies to add another hundred miles to their journey eastwards by making this slight detour to Puket.

It is perhaps too early to seriously discuss this revolution in Far Eastern travel until the Indo-China and Siamese railways are connected at Battambong. When this is accomplished, the pressure of tourist travel and other influences will probably be strong enough to compel this change in the old established travel routes. The Siamese authorities very wisely are keeping their own counsel about the Kra Canal project. It may be pigeonholed or it may be under consideration. The difficulty lies in its financing. Perhaps that is one reason, why the Financial Adviser to the Government of Siam is one of the most competent and experienced British experts on Oriental and Asiatic affairs.

## Siamese Railway Extensions

THE Siamese Budget Estimates for the current fiscal year allocates the sum of Tcs. 4,060,000 for the state railways which includes Tcs. 2,000,000 for the Korat-Konkaen Line, Tcs. 700,000 for remodelling the Bangkok Station yard and Tcs. 600,000 for a sorting yard at Bangsue.

The railway estimates are to complete the extensions totalling 335 kilometers recently authorized by Royal Decree. One of the new lines will run from Konkaen in a northerly direction, a distance of 140 kilometers to Nongkhai on the Indo-China border, while another line will extend eastwards from Banlingson to the Indo-China border, terminating at Nakon Panom, a distance of 215 kilometers.

The surveys are to be completed within two years and part of the work will be carried out by the Cie. Aerienne Francaise de l'Indo-Chine, while the balance of the work will be conducted by the Siamese Railway authorities. These two lines will ultimately link up with the Indo-China State Railways, providing a direct connection between Bangkok and Hanoi. The Indo-China authorities are building a railway to connect Pnompenh with Battombong and will eventually extend it to the Siamese frontier, linking Bangkok with Saigon.

It only needs the connection with Burma to bring Siam into close communication with her immediate neighbors. There has been considerable talk these past few years of the early completion of the Burma-Siam line connecting Mergui with Ye, but a recent statement by the Governor of Burma indicates that

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# Japan's Electrical Industries

## Factors Which Make for Progress

THE Engineering and Power Conference held in Tokyo last November brought forcibly to the attention of the world the remarkable advances made in Japan's electrical industries. It was only a few years ago that Japan was one of the foremost markets for foreign electrical machinery. Today, the Japanese manufacturers of electrical machinery and equipment are able to furnish practically all their own requirements. There are many factors which have helped to bring this about, all indicative of the determination of the government to make the nation self-sufficient in its key industries. This policy is strengthened by a high import tariff; government preference for home made goods; early adoption of new types of machinery and apparatus; low cost of development of new designs; co-operative financing of users and manufacturers by banking institutions and an alliance with foreign manufacturing concerns.

One of the visiting electrical engineers to the World Power Congress made an intensive study of the Japanese electrical industry and emphasized the above points in a most interesting report to his head office. While recognizing the many splendid qualities of the Japanese manufacturer, he indulges in certain pointed criticisms which the Japanese should give heed to. It is now universally recognized that the Japanese have passed the so-called imitative stage and in many scientific and technical lines have developed to a point where they have something to teach other nations. The practice of sending industrial and engineering missions to other countries, where they are courteously received and given every opportunity to visit and inspect factories, and industrial plants has been of great benefit to Japanese manufacturers. But if these courtesies are to continue, they must be reciprocal.

It may be that certain Japanese manufacturing plants for one reason or another are not prepared to invite the critical inspection of expert foreign observers, but this conservatism or modesty should not apply to public utility or purely industrial plants. Japan has arrived at that stage of her industrial development, when the rest of the world wants to know what she is doing.

Succeeding Japanese Governments have always carried out the consistent policy of developing their manufacturing resources as rapidly as possible. This decreased national dependence on external sources is essential in the electrical industry, since existence in the civilized world to-day greatly depends on electricity. It also provides employment for a considerable volume of labor during the industrialization of the nation. It also improves the national trade balance by reducing the volume and value of imports.

Direct support to the domestic industry is given by a high import tariff. The duty is especially heavy on completely manufactured plant and apparatus, while partly manufactured material and war products, available within the Japanese Empire, have lower duties imposed upon them. Raw materials not available within the Japanese Empire are, in most cases, exempt.

Further direct assistance is given by the official instructions issued by the Central Government to Municipalities, Government operated and semi-Government controlled utilities, to the effect that domestic manufactures only are to be purchased wherever possible.

Indirect support is more obscure, but it exists. For instance, a Government Department calls for designs from domestic makers only. After consideration, the purchaser will decide on a composite design, and orders are distributed to the domestic manufacturers, usually in accordance with their manufacturing capacity. The price paid in such cases is, frequently, a reasonable percentage above the prevailing market price.

Both buyers and manufacturers in Japan are distinctly progressive in their policies. The user of electrical apparatus and plant continuously watches with keen interest any internal and external developments in the electrical industry. Should a new type, or design of machine, or apparatus appear and is not procurable in Japan, then samples are imported. These samples are studied in minute detail both by the user and the local manufacturer, and the whole Home electrical industry benefits thereby.

Manufacturers in Japan do not, as a general policy, spend large sums of money per annum in developing new designs and types of apparatus or machinery. There are one or two exceptions to this, such as the Tokyo Denki K.K., which maintains an extensive Research Laboratory. In many cases, the domestic manufacturer studies all types of imported apparatus, and then evolves a design considered to be suitable for the market. Otherwise, a manufacturing agreement under licence from a foreign manufacturer is concluded. However, the net result is that the domestic manufacturer benefits by obtaining modern designs at a much lower cost than the initial expenditure made by the original manufacturer to develop the new design, or type.

The leading Japanese Banking Institutions have deeply interested themselves in industrial manufacturing concerns. In addition, these banks finance utilities such as electric power, generating, distributing and transportation systems. This dovetailing of interests is of considerable benefit to the Japanese electrical manufacturing industry, since it provides them with an assured turn-over.

The establishment of Joint Japanese-Foreign manufacturing enterprises has greatly accelerated the development of the electrical manufacturing industry. Without the foundation provided by the longer established foreign manufacturers, the rapid development of the industry would not have been possible. These liaisons were imperative, not only to the rapidly expanding Japanese electrical industry, but also to the importing manufacturer. The handicaps placed upon the importing manufacturers, described in a later paragraph, give additional reasons why it is advisable to be directly associated with a manufacturing enterprise in Japan.

Each year, the Japanese Government Departments, the Power Utilities, the Railways and Manufacturers, send various members of their organizations abroad to inspect and report on the electrical industry in all manufacturing countries. A large amount of varied and useful information is thus obtained. These visitors, in the past, provided they have had the usual letter of introduction, have been accorded considerable courtesy, and given a large volume of information and drawings. Considerable enterprise is shown by the adoption of this system to maintain the Japanese Electrical Industry up to date. It has, however, received a setback during the past few years. This is due to the fact that representatives from foreign countries when they have been in Japan have been refused admittance to plants, utilities and works on various pleas. In several cases they have been executives of Companies, who, on their return, have stipulated that no Japanese engineers are to be shown through their plants. In fact, many engineers returning from abroad complain bitterly that they have been turned away. The principal cause of this, is a lack of reciprocity. The result is that this avenue of useful knowledge is gradually being closed to the Japanese electrical industry.

The domestic manufacturer is further benefited by the handicaps under which the importing manufacturer operates. The importer has to pack his goods in export cases, which must be strong enough to withstand the hazards of shipment. This type of packing is much more costly to the foreign manufacturer than the inland packing of the domestic manufacturer. The importing manufacturer has also to pay heavy rail, freight and insurance charges from his foreign factory to a Japanese port, in contrast to the much lower freight and insurance charges resulting from the geographical proximity of the domestic maker to delivery point.

The import duty, previously mentioned, landing and clearing charges at a Japanese port, and further costs to be borne by the foreign manufacturer selling in Japan.

In delivery time, the importer cannot overcome the three months absorbed in shipment and clearing through the Customs. Other handicaps, such as distance from the factory and expensive local overhead charges exist, all of which tend to reduce the importation of electrical machinery and apparatus. To avoid these handicaps and trade on an economic basis, foreign manufacturers are

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# The World Trade Outlook

By James A. Farrell, President, United States Steel Corporation; Chairman of the National Foreign Trade Council

Address Delivered at the First General Session of the Seventeenth National Foreign Trade Convention, Los Angeles, May 21

THE international commerce of the world is passing through a period which finds no close parallel in recent years. Measured by the usual standard of the dollar values of exports and imports, its present rate of activity is shown to be considerably slower than that of only a few months ago. The customary examination of totals for the calendar year does not correctly reveal the present situation. The trade of the first eight or nine months of 1929 proceeded at an unusual pace, so that despite the slackening that occurred toward the close of the year the aggregate for the full twelve months constituted a new record, both for the United States and for the world. Our exports for 1929 approximated five and a quarter billions. They were the greatest in value since 1920, which was a year marked by special conditions that unfitted it for use as a standard of comparison. In volume, our exports for last year were the greatest ever recorded, a fact which is emphasized by consideration of the lower commodity prices which obtained generally throughout the year.

There was a gain in imports during 1929 of seven and one half per cent. in value and probably of a higher percentage in volume due to the fact that prices were lower on several of the raw materials and crude food stuffs, which constitute a large part of the volume of our imports. Nine of the twelve leading imports were obtained at lower prices last year than in the year before. An outstanding case was that of rubber, the importation of which for 1929 was almost thirty per cent. greater than in the preceding year although the total value was about two per cent. less.

Under normal conditions or with a world situation approximating that which obtained in the first half of 1929 these heavy imports of raw materials would have indicated at least a continuance of the rate of industrial production in the United States, if not an actual increase of our activities.

These figures for the first nine or ten months of last year present a picture that would be more pleasant to contemplate if we did not realize that several of its prominent features have undergone marked changes since last fall.

There are certain factors of last year's situation, however, which even under present conditions are worthy of consideration and which offer considerable stimulation to continued effort on our part. Probably the outstanding feature of American foreign trade during the last score of years has been the marked change that has occurred in its character, the steady decrease in the proportion borne by raw materials and food stuffs in the total of our exports and the corresponding increase in the proportion won by the products of manufacture, including the three great groups of finished manufactures, semi-finished manufactures and manufactured food stuffs.

Our export trade for the calendar year 1929 showed that raw materials and crude food stuffs combined were slightly more than one quarter of the whole, whereas, products of manufacture constituted nearly three quarters of our total exports, and finished manufactures alone were approximately one half of the total. That is what we have been striving for during the past fifteen years.

There is genuine encouragement to be found in consideration of this fact for it is notable that the gain was achieved in precisely that element of our export trade that is directly responsive to merchandizing enterprise and skill.

It is well known that in the case of raw materials and crude food stuffs the initiative lies with the buyer rather than with the seller. Those who need raw materials for their industries search the markets of the world to secure them. Demand for selling effort is minimized by the activity of the buyer.

But in the case of the products of manufacture, the initiative is on the part of the seller. This calls for enterprise and skill in merchandizing, and it is particularly in that factor of our foreign trade that the United States has made the most important advance in recent years. The ingenuity of American producers in turning out a great variety of articles of convenience, service and amusement

has contributed substantially to this development. The enterprise of the producers of processed or packaged foods has also had its share.

California now ranks fourth among the states as a source of American exports. In 1926 her exports, exclusive of re-exports of foreign merchandise, were valued at \$287,808,000; in 1929 this figure had mounted to \$372,536,388. In the same period, imports solely for American use rose from \$259,710,000 to \$276,347,512 and gross business from \$547,518,000 to \$648,883,900. Los Angeles has shown the most startling increase in foreign trade, exports having multiplied in value 200 times in 14 years.

The vigorous efforts made in foreign markets, demonstrating to other peoples possibilities of increasing their range of food supplies, have aided materially in the growth of our export trade.

Encouragement for the future lies in the fact that our merchandizing organization has not been affected adversely by the conditions which have brought about the general slowing up of international commerce all around the world. Our producers and traders have not lost skill because the volume of their trade has decreased, and it is certainly a fact that they have not lost enterprise and courage. On the contrary, it would be in accordance with what we believe to be genuinely characteristic of them to see them put forth even greater effort and show increased determination rather than yield to discouragement due to temporary factors.

We have been receiving during the last few months a new demonstration of the important proposition that if we are to maintain the rate of progress in international commerce to which we have attained, and especially if we are to add to it as we should, we must be alert and active. We must study conditions and situations as well as production. The business of trading with the other 122 markets of the world will not permit relaxation if success is to be achieved.

If we will make a candid and open-minded examination of the present situation of world trade, with the purpose of disclosing its causes, so that we may guard against their repetition, we will come, as always in such cases, to certain economic facts that are of controlling importance. The position of the United States as a factor in international commerce, and our relation to the enterprise of all the world is revealed in a light that seems not to have been thoroughly considered by a large part of our people.

About two years ago there began to be observed in various parts of the world, a tendency toward lessening prices, especially of raw materials. The fact was noted and commented upon somewhat by observers in this and other countries. It may be that sufficient thought was not given to the matter, or to an examination of the causes of the movement. A lowering of prices which springs from lessened costs of production is not likely to have disturbing effect upon general trade. It is more probable that it will be localized in result, and ultimately beneficial rather than otherwise. But a decrease in prices that indicates an intensive effort to dispose of products in a saturated market; or that is an attempt of the producer to carry on at full speed in spite of diminished purchasing power in his field of distribution; or that points to a development



James A. Farrell, President of the United States Steel Corporation; Chairman of the National Foreign Trade Council

of competition beyond the stage of due regard for production costs, is practically certain to lead to disadvantageous results.

At the present time we have met, it seems to me, another important situation that may have been a strongly influential factor in bringing about the reduction of prices that has continued for the last two years. That is the condition that has obtained during the same period in the American money market. I know it is not unusual to refer to the dramatic collapse in the security markets last fall as a prime cause of present conditions in foreign trade. But it occurs to me that the conditions in the money market which preceded for nearly two years the spectacular events of October and November are much more likely to have exerted extensive influence on international commerce than did the abrupt return to a more nearly normal situation.

A circumstance that bears directly on international trade is the ease, or lack of it, with which exchange may be obtained in any market to meet obligations due in other countries. Sufficient exchange available at reasonable cost and without trouble facilitates trading conditions. On the other hand scarcity of exchange, so that it is obtainable only with difficulty, sometimes amounting to hardship, and at premiums that may run to almost prohibitive rates, is bound to produce a distinctly adverse effect.

At the present time Australia because of the lack of sufficient supply of exchange has erected trade barriers. Similar conditions recently existed in Brazil.

There can be no doubt that conditions in the American money markets for the last two years adversely affected the supply of foreign exchange, particularly of dollar exchange, available in many of the markets which are usually good customers for American products in great variety and volume. Rates for the use of money here rose to a point which made it difficult, if not impossible, for many of those in other countries who had need of capital, and could offer sound security and usually advantageous terms to American lenders, to obtain here the funds they required. In many cases this resulted in postponement or abandonment of enterprise that might have given employment to workmen, developed local production, and in other ways maintained or stimulated the purchasing power of the borrowing market.

Free capital in this country turned from foreign investment to the more highly remunerative speculative markets at home. The result was a sharp decrease in foreign investments, and correspondingly, in the supply of dollar exchange otherwise available for the purchase of American merchandise exports. In consequence partly if not wholly, of this situation, the foreign securities publicly offered in the United States in 1929 had the lowest aggregate value such offerings had had since 1923. The decrease in Latin-American issues was 60 per cent. as compared with 1928. The total of foreign securities offered in the United States last year was slightly above \$700,000,000 as against over a billion for each of the several preceding years. In view of these facts it is not difficult to understand the situation in several of our important foreign markets where payment for imports from the United States is readily offered in local currency but remittance in dollar or sterling exchange is well nigh impossible.

Another circumstance that has borne heavily upon the general trade situation of the world is the sharp drop in the price of coffee in Brazil. The same condition existed in West Africa in cocoa, in the Straits Settlement in rubber, in the rice markets of Indo-China, and in the sugar markets of Cuba, all of which were primarily due to the break in the long-continued, but economically unsound, effort to maintain an artificial price through governmental action. The accumulation through this process of supplies that would last the world for two years, coupled with the fact that each year's production furnishes some addition to the surplus, created a situation that has worked serious harm. And yet in the face of this devastating and ruinous demonstration of the fallacy of that method of interfering with the law of supply and demand, there are those in our country who insist that our Government shall embark upon a similar experiment in behalf of some of their products.

I shall not endeavor to carry further this analysis of the cause of the present situation. No doubt other factors than those mentioned have had their influence, but those discussed seem to me to have been important. One other circumstance may be mentioned as of possible influence. We are all familiar with the necessity and value of thorough correlation of all functions in our own enterprises, and of the bad effects of failure to secure such co-ordination. It is the importance of what is popularly known as "team-work." It

seems clear that the situation in our money market to which I have referred disturbed the financial machinery of the various world markets, which under the developments of modern communication and transportation has been knit so closely together as to be quickly susceptible to the influence of such a disturbing factor.

I have been discussing the situation that has marked various world markets for the last six or seven months, with special reference to circumstances that originated in the United States. Now a new factor has appeared, also here, which gives promise of a certain amount of relief. If it is true that the slackening of world trade was influenced to some extent by money market conditions in the United States preceding the break in the security markets, it seems also probable that the break itself may ultimately cause some measure of remedy. For it has been followed by an easing of money rates which is already turning the attention of American investors again toward sound foreign securities.

In fact some flotations have been affected, and there are reports of negotiations under way for loans and investments in foreign markets running to an aggregate equal to, if not in excess of, those that were made prior to the changed condition in our money market. One authority on foreign investments has published an estimate of \$667,000,000 for Latin-America alone.

It seems likely that we may soon resume a rate of foreign investment approaching that of several years ago, with corresponding ease of the market for dollar exchange. If, therefore, it is true that the restriction of dollar exchange contributed forcibly to the slackening of trade, the corollary must be true that ease of exchange may aid in restoring trade conditions.

As a creditor nation we should bear our fair share of the burden of rehabilitation. If this year, as in former years, our travellers expend six or seven hundred million dollars for food, service and travel, in other lands, and our investors invest a like amount in sound foreign enterprises we shall have furnished a substantial contribution toward re-establishing the world trade equilibrium.

It is, however, comforting to reflect that the world trade outlook is improving and that we may look forward to an increasing volume as the year progresses.

## Japan's Electrical Industries

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forced to produce their goods within the tariff wall, and in proximity to the consumer.

It will be seen that the Japanese electrical manufacturing industry enjoys every advantage for its development, supported from all points of view in a rapidly expanding market. Although considerable advances have been made technically, only one or two machinery manufacturers are making a net profit.

This poor financial success, especially of the machinery manufacturers, is due to disastrous cut-throat competition. There is no real co-operation with the result that most of the competitive business is taken at extremely low prices, sometimes, even below manufacturing cost.

It is interesting to note that the Power Utilities in Japan are gradually consolidating themselves into a small number of large concerns. This is important to the manufacturing industry for two reasons:—

Firstly, these utilities are the largest purchasers, and consolidation will give them considerable power over the sellers of electrical machinery and apparatus.

Secondly, the utilities are consolidating to remove unnecessary and very detrimental competition, which has, in the past, reduced their net returns to an uneconomic basis.

If the electrical machinery and apparatus manufacturers are not to be at the mercy of these large consolidations, they must also combine on a co-operative basis, follow the examples of the utilities, and eliminate the prevailing ruthless competition. Technical advance in the electrical manufacturing industry in Japan cannot proceed alone. It must be accompanied by sound financial operation.

# The Proposed Water Purification Plant for Nanking

NANKING has long suffered from an inadequate water supply. The local authorities and commercial bodies have, on several occasions, attempted to solve this problem by boring deep artesian wells and transporting river water by the city railway, but unfortunately all these methods proved inefficient.

Believing that the construction of an up-to-date water purification plant is the only way to give to Nanking people good and sufficient water, Mr. Liu Chi-wen, late Mayor of Nanking, has decided to construct a new municipal waterworks with an initial capacity of ten million gallons per 24 hours day, financing the undertaking with a special municipal loan of three million Chinese dollars to cover the cost of construction.

The proposed 10-m.g.d. water purification plant for Nanking is designed to supply water to the present consumers within the existing populated quarters and environs, with provision for a ten million gallon extension to meet the immediate increase of consumption. The population of Nanking is now about 510,000 which is estimated to reach 1,000,000 within 20 years. So, in this first 10 year period Nanking will enjoy a *per capita* water consumption of 16 gallons per day.

The new plant was designed by the Chinese waterworks engineers embodying certain patented appliances, supplied by foreign manufacturers. The general layout is shown in the accompanying plan :

## The Raw Water

The raw water supply will be taken from the Yangtze River, about three kilometers from the west suburb of Nanking. At Tai-Sing-Kwan, the river is then diverted by the Kiang-Sing-Chu isle to form a channel, which reunite with the main stream near Shan-Sing-Ho. The intake and waterworks compound are located on the eastern shore of the channel.

Dredging is to be carried on wherever the river bed is shallow, as would be the case near the entrance of the channel and at the intake.

## The Intake

Water entering the intake is first racked and screened through a set of mechanical screens and then elevated by two low-lift pumps, into the chemical house of the plant. The flow through the plant is then by gravity until the filtered water reaches the high lift pump.

Two lines of 40 inch steel pipe, running from the intake crib to the pump-pit will be laid on the bottom of the channel, the length of each line being about 100 meters.

The crib supporting the strainers of the intake pipe is a reinforced concrete structure with brass wire nets on the sides to protect the inlet opening from drifting dirt.

The raw water pump house is located near the river pump-pit, so the suction pipes of the pumps draw water from it and deliver it to the coagulation

basin. The revolving mechanical screens and the raw water pumps are housed in the same pump-house.

## Plant Operated Electrically

Power for operating the entire plant is furnished by a separate power plant, due to the fact that, at present, the city power station is unable to furnish current other than that required for city lighting. An independent power plant, will ensure more safety to the service of city water supply. Furthermore, the Nanking city power plant is to be enlarged and the erection of a considerable plant in the vicinity of Nanking waterworks will be expected in the near future.

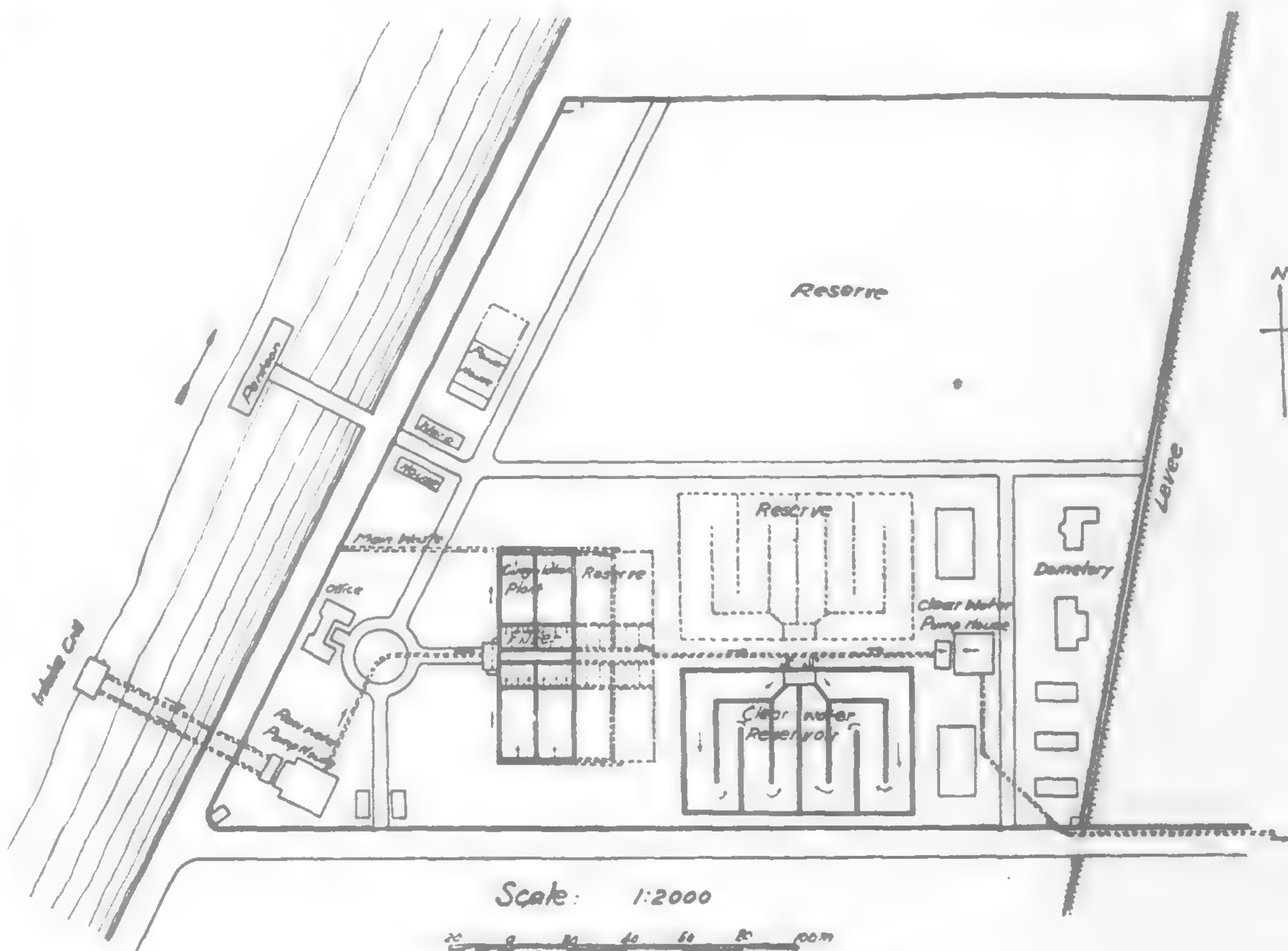
When the city power can be utilized more economically then the waterworks power plant can be used as standby. In case of need, the Diesel engines can take the full operating load of the plant in few minutes.

The three Diesel engines are of the Deutz compressorless solid injection V M S 158 type, with 6 cylinders, output 600 B. H. P. and speed 250 R. P. M. The Diesel engines are coupled to three 3-phase Siemens Schuckert flywheel type alternators, each having an output of 500 K.V.A. 50 cycles and 6,300 volts. Two sets are used to take the normal load when the plant operated in full capacity, and one set as reserve.

The switchboard for controlling the generators and the current distribution consists of a self-supporting frame with three generator panels, one bracket for synchronising instruments, three feeder panels, and one transformer panel for transformer control and the lighting distribution.

The power house is so arranged as to provide space for another 1,000 B.H.P. Diesel engine for future extensions.

The power plant is designed so that the city power can be switched on without difficulty.



General Plan of Nanking Waterworks

Raw Water Pumping Plant

Three raw water single stage centrifugal pumps of Weisse Sohne Halle, Germany, each with a capacity of 5,130,000 gallons per 24 hours day are to be installed. The manometric head for the low-lift pump is estimated to be 15 meters. The pumps are to be lowered about 3 meters from the ground surface, to meet the fluctuation of the river level during the different seasons of the year.

The pumps are driven by Siemens Schuckert synchronous motors of the open type with slip ring rotors. The permanent output of each motor is 68 B.H.P., and the voltage is reduced to 500 volts.

Clear Water Pumping Plant

The work of elevating the clear water from the clear water well, through the feeding main, to the distribution reservoir on the top of the Ching-Liang Hill is done by three motor driven Weisse Sohne single stage centrifugal pumps with two sets working and one set in reserve. The total manometric head is estimated to be 73 meters. The centrifugal pumps are directly coupled to Siemens synchronous a.c. motors, of the type LNC X 11a, and have a capacity of 13.5 cubic meters per minute. The motor has 315 h.p. each and the speed of 1,475 r.p.m. and is of ventilated protected type, specially designed for pump drive with slip ring rotor. A high tension switch plant is installed in the clear water pump house.

Treatment of Water

After different analyses made by the Water Research Laboratory, the water appears to have about the same degree of hardness as that of the Whangpoo River and is of sufficient alkline reaction to ensure complete coagulation of the suspended matter by means of sulphate of alumina without the addition of lime or other chemicals. A half grain to two grains per gallon of alumina sulphate is sufficient to ensure good coagulation in three hours according to the variation of temperature and the amount of total solid presented in water.

The raw water from the low lift pumps should receive its treatment of alum before entering the coagulation basin, and mixed thoroughly by means of mixing channel with suitable baffles. The water then passes to sedimentation in the coagulation basin for not less than three hours.

Rapid gravity filters are used to filter the treated water from the coagulation basin and to deliver it by gravity to the clear water reservoir. Before entering the feeding main to the city, the clear water is sterilized by a set of chlorinators.

The construction of this purification plant can then be effected in two ways, namely, (1) by purchasing the materials and equipments of the coagulation basin and filter house from a manufacturer of any patent type filter, and carrying out the erection works according to its designs and plans, (2) by designing a sedimentation basin, and a new rapid gravity filter plant the waterworks engineer himself according to the modern engineering practice and ordering their equipments and materials from their special manufacturers.

In the former case, the whole plant is designed by the contracting engineering company and erected under the supervision of its engineer supervisor, in the latter case, the waterworks engineers themselves undertake the designing and erection.



Proposed Piping System of Nanking Waterworks

The adoption of any patent type filter would possibly mean the increasing of the first cost on the plant, but it would be justified finally by perfection of service in that particular line.

The Distribution System

The Nanking Waterworks has decided to use steel pipe for the distribution system in the city.

A 36 inches steel main running from the clear water pump-well, straight across the field of Han-Sec-Men suburb to the balance reservoir of Ching-Liang Hill, measuring totally 3,258 meter in length will furnish the supply to the city.

In planning the piping system, care has been taken to form some suitable gridiron system in order to strengthen the circulation of water in the whole city. The size of steel pipes range from 24 inches for the feeding mains to three inches for supplying water to small lanes. The pipe laying would be divided into several periods, according to the requirements. The length of mains for the first period is estimated as follows :

Diameter	Length in Meter
900	5,400
600	4,130
500	10,210
300	13,660
200	32,220
150	51,900
100	22,020

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# Official Program for the Development of Local and Telephone Systems in China

JOONVIN T. CHWANG

SINCE the unification of China by the National Government, it is planned to develop every line of business and industry step by step. Among these, telephone communication has been most important. Within recent years, the demand for telephone communication both local and long distance has increased by leaps and bounds, whereas the present system, although established for over thirty years, has only 50,000 subscribers and very few toll lines. The Ministry of Communications, has therefore under consideration a comprehensive scheme to develop the local and long distance telephone system into a national unit. The proposed local telephone system is based upon the following principles :—

- (1) All the big cities and ports to be equipped exclusively with automatic telephone instruments.
- (2) To equip all the smaller cities with the manual telephone instruments that are to be taken from the big cities, and in case of further extension, to install automatic instruments.
- (3) To install in all small towns the manual equipment taken from the smaller cities, and when worn out, to gradually replace with automatic instruments.

As to the proposed toll and long distance telephone system, there has been designed a new scheme based upon the following principles.

- (1) To enable all political centers throughout the whole country to converse directly.
- (2) To enable all commercial centers which have close connection throughout the whole country to converse directly.
- (3) All districts in the country to have at least one toll cut-in station.
- (4) To diminish the exchange operations to a minimum when setting up a connection between any two very distant cities.
- (5) To make the cost of the lines most economical. The construction of both systems will be carried out by six year periods according to the demand. The program for the first period is shown in the attached list.

The work to be done during the second period will be determined after completion of the first period work. The estimated expense for the first period is as follows :

1st year	...	...	...	M. \$ 9,600,000
2nd	..	...	...	6,900,000
3rd	..	...	...	7,700,000
4th	..	...	...	7,700,000
5th	..	...	...	8,400,000
6th	..	...	...	9,700,000
Total ...				M. \$50,000,000

### INSTALLATION OF AUTOMATIC TELEPHONES

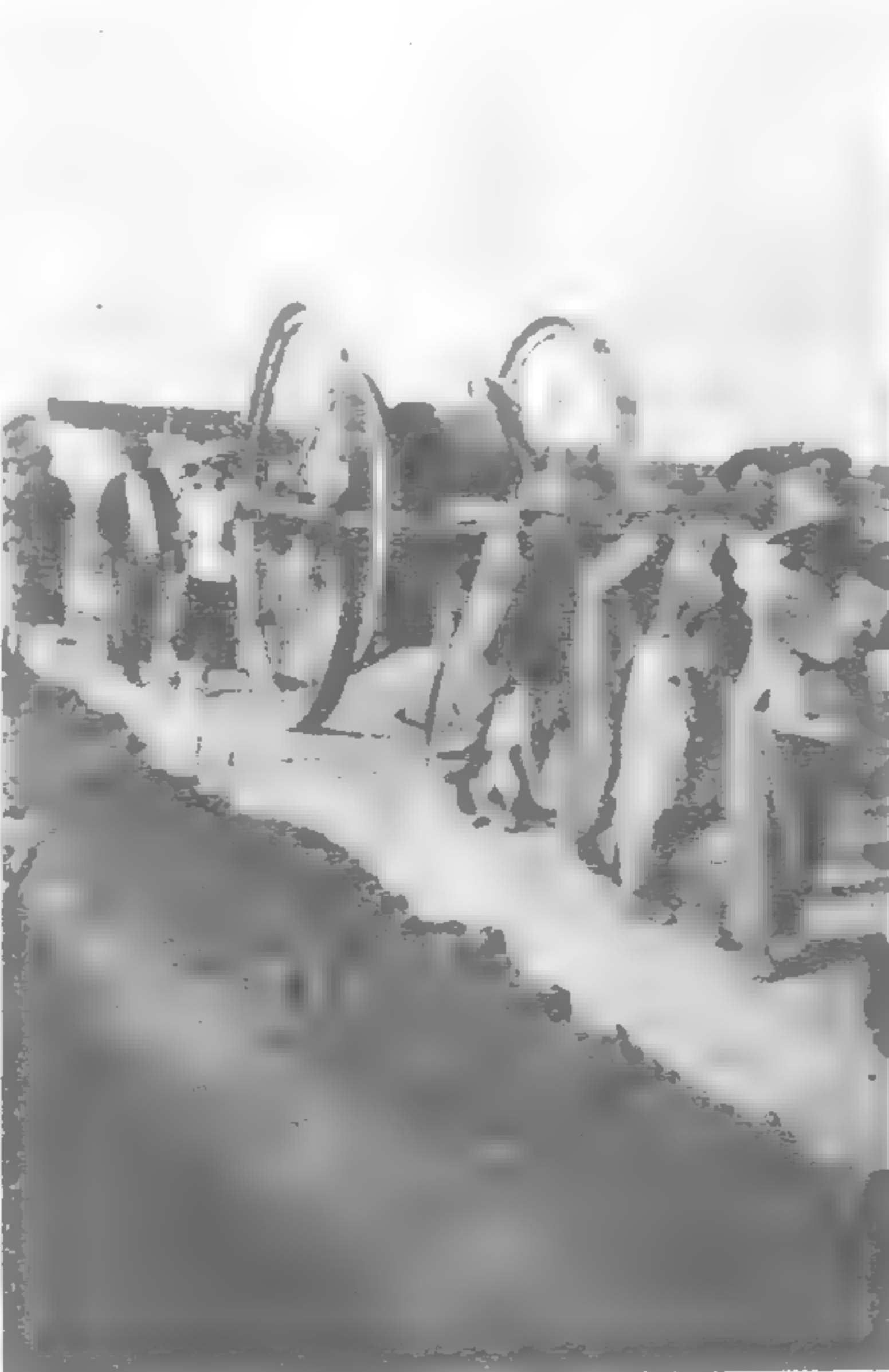
	City	Number of Lines
First Year ...	Nanking	5,000
	Shanghai	4,800
	Hankow	8,500
	Tsingtau	3,000
Second Year ...	Hangchow	3,000
	Changsha	2,000
Third Year ...	Nanking	3,000
	Tientsin	7,000
Fourth Year ...	Peiping	5,000
	Yingkow	1,000
	Six Middle Class Cities	Each 500
		10,000
Fifth Year ...	Peiping	3,000
Sixth Year ...	Nanking	5,000
	Hankow	5,000
	Six Middle Class Cities	Each 500

### REPARATION AND RECONSTRUCTION OF MANUAL TELEPHONES COMMON BATTERY SYSTEM

First Year ...	Chinkiang	1,000
	Taiyuan	1,000
	Wuhu	800
	Yangchow	800
	Soochow	1,000
Second Year ...	Chefoo	2,000
	Nanchang	1,000
	Anking	1,000
	Kaifeng	1,000



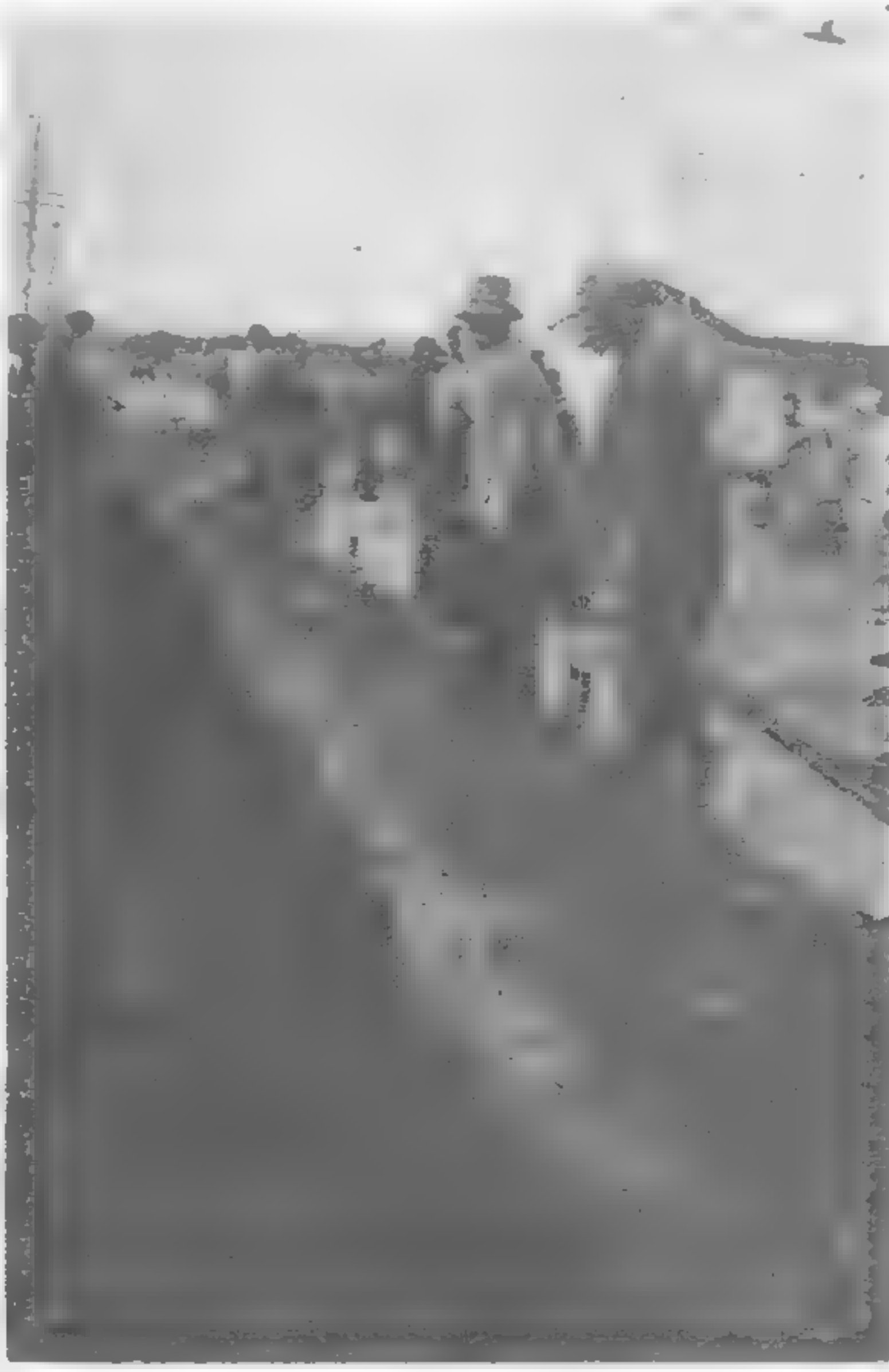
Pulling Cable Through the Manhole in Front of the Ministry of Navy, Nanking



Laying Cable Along Chung-san Road, Nanking



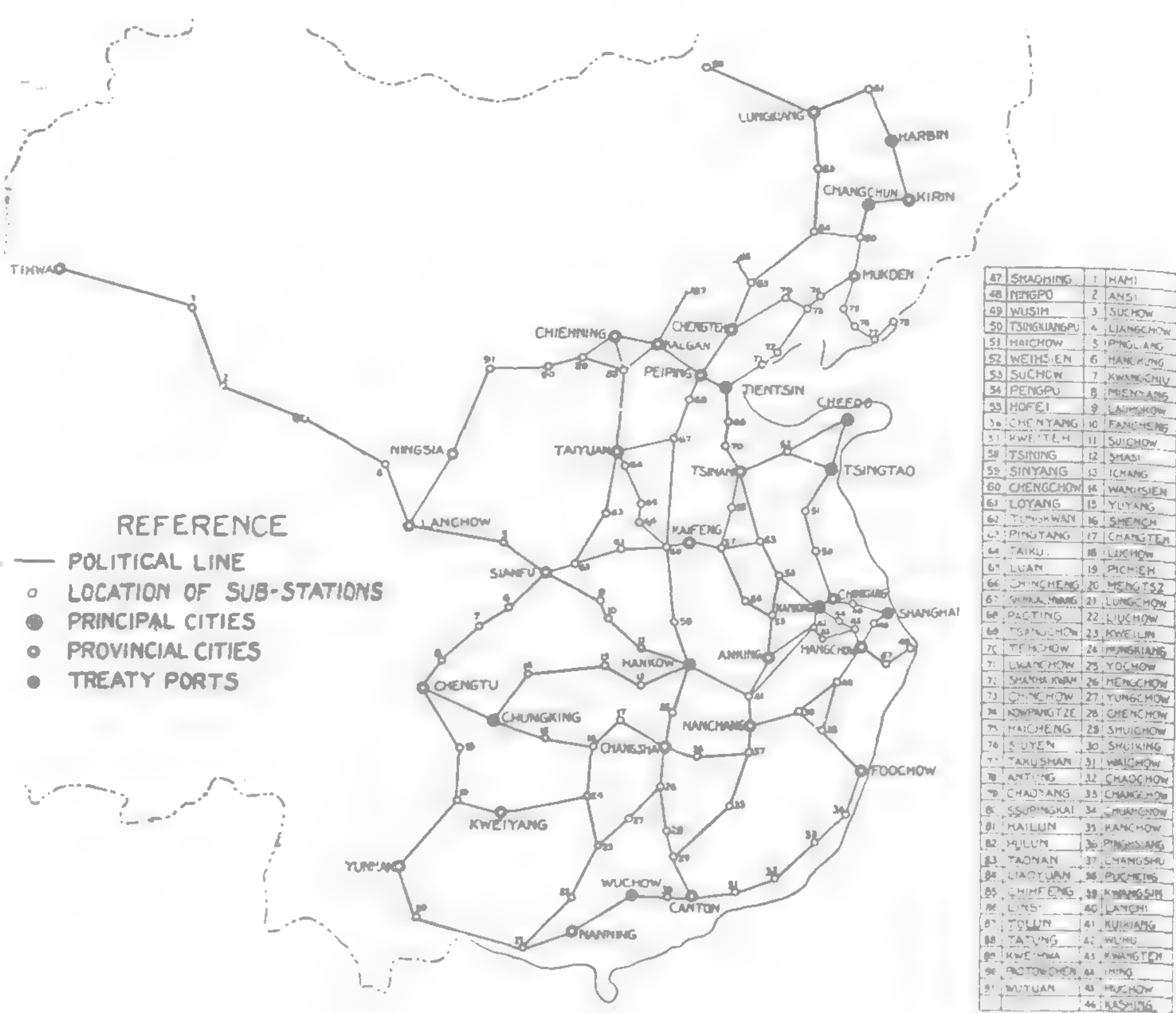
Laying Cable Along Chung-san Road, Nanking



Laying Cable Along Chung-san Road, Nanking

REPARATION AND RECONSTRUCTION OF MANUAL  
TELEPHONES. COMMON BATTERY SYSTEM

	City	No. of Lines
Third Year ...	Wuchow	1,000
	Kunming	1,000
	Kweiyang	1,000
	Sian	1,000
Fourth Year ...	Kirin	1,500
	Changchun	1,000
	Lungkiang	1,000
	Chengt'u	1,000
Fifth Year ...	Chungking	1,000
	Changkiakow	1,000
	Lanchow	1,000
	Tihwa	1,000
	Chengt'ehfu	600
	Kweisui	600
	Ningsia	600
Sixth Year ...	Chinkiang	To be figured out later on.
	Taiyuan	To be figured out later.
MAGNE TO SYSTEM		
First Year ...	Ichang	500
	Kingtehchen	500
	Two Middle Class Cities	Each 500

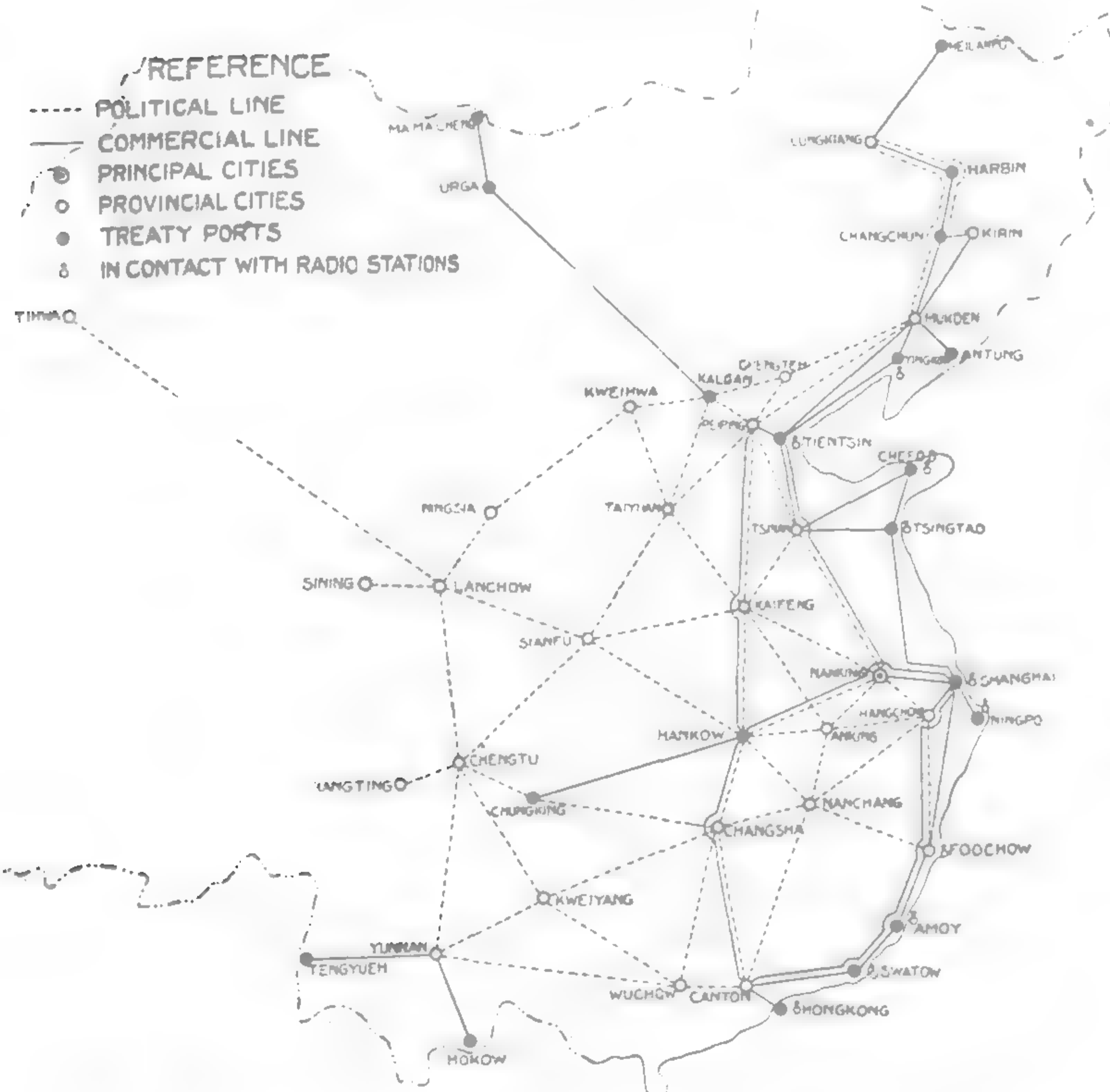


Plan Showing the Location of Main Lines of the Chinese National Long Distance  
Telephones

INSTALLATION OF TOLL LINES

First Year ...	Two Circuits for Shanghai-Hankow Line.
	Two Circuits for Hankow-Peiping Line.
	Two Circuits for Shanghai-Hangchow Line.
	Two Circuits for Shanghai-Nanking Line.
Second Year ...	Four Circuits for Canton-Kiulung Line.
	6,000 li for important branch lines.
	Two Circuits for Nanking-Tientsin Line.
	Two Circuits for Canton-Hankow Line.
Third Year ...	Two Circuits for Tsingtau-Shanghai Line.
	Two Circuits for Chefoo-Tsingtau Line.
	6,000 li for important branch lines.
	Two Circuits for Shanghai-Foochow Line.

Third Year ...	Two Circuits for Shanghai-Foochow Line.
	Two Circuits for Foochow-Canton Line.
	Two Circuits for Hangchow-Ningpo Line.
	One Circuit for Canton-Wuchow Line.
Fourth Year ...	One Circuit for Wuchow-Kweiyang Line.
	One Circuit for Kweiyang-Kunming Line.
	6,000 li for important branch lines.
	Two Circuits for Chengtu-Hankow Line.
Fifth Year ...	One Circuit for Kiukiang-Canton Line.
	Two Circuits for Foochow-Nanchang Line.
	One Circuit for Suchowfu-Sian Line.
	One Circuit for Taiyuan-Shihkiachwang Line.
Sixth Year ...	One Circuit for Taiyuan-Tatungfu Line.
	6,000 li for important branch Lines.
	One Circuit for Sian-Lanchow Line.
	One Circuit for Peiping-Kuyuan Line.



Plan Showing the Location of Main Lines of the Chinese  
National Long Distance Telephones

BRIEF SPECIFICATION FOR THE INSTALLATION OF TOLL TELEPHONE  
SYSTEMS

General :

1. This brief specification covers the supply of materials, construction of lines and the installation of equipments of the proposed Toll Telephone System in China.
2. Lines are to be built up in accordance with above program.
3. Construction work is to be carried out by the Government and the installation of equipment by the supplier.
4. Exact quantities of line material and equipment required to be calculated after a practical survey by the interested manufacturer ready to supply and finance the same.

*Lines :*

1. Non-loaded open wires are to be used for all lines except the most important sections such as Nanking-Shanghai, Canton-Kiulung, etc. For these sections loaded underground or aerial cables are to be used if necessary.
2. According to the drawings prepared by the Ministry toll lines are divided into four kinds, namely :—
  - (a) Direct Main Lines
  - (b) Sectional Main Lines
  - (c) Direct Branch Lines
  - (d) Sectional Branch Lines.

Open wires used for the first three kinds of toll lines are to be S.W.G. No. 11 smoked copper wire, and those used for the last kind of toll lines are to be S.W.G. No. 14 smoked copper wire.

3. Large-sized porcelain insulators with straight pins are to be used for No. 11 wire, and middle-sized ones for No. 14 wire.
4. Four-wire wooden arms with iron braces are to be used for all open wire lines. Iron brackets are to be used for supporting transposition insulators.
5. Round chemically prepared fir poles are to be used for all open wire lines as a standard and square reinforced concrete poles for exceptional cases.
6. The standard size of wooden poles are to be 28-ft. by 5-in. for main lines, 26-ft. by 4½-in. for direct branch lines and 24-ft. by 4-in. for sectional branch lines. The size of poles for wires inside the cities or across railroads, rivers, streams, etc. are to be as big as required.
7. Open wire toll telephone lines are to be hanged on the same poles with telegraph lines as far as possible.

*Equipments :*

1. According to the drawings prepared by the Ministry, there are several kinds of Toll Centers. In each Toll Center, recording, exchanging and testing apparatus are to be installed. These apparatus should be the same type as those used in the local telephone system.
2. In the Toll Centers where the lines split and in those which are about 160 miles apart from their neighboring direct communicating Toll Centers, vacuum tube repeaters are to be installed. Line circuit type and cord circuit type repeaters are to be used respectively for through and terminating lines. Vacuum tube amplifying devices are to be used in the far away terminating stations.
3. In all Communicating stations as shown in the drawings prepared by the Ministry, toll cut-in apparatus and portable test sets are to be furnished.
4. Phantom, composite and simple apparatus are to be installed in all Toll Centers and Communicating Stations when necessary.
5. Carrier current works are to be tried between the most important cities such as Nanking to Shanghai, Canton to Hongkong and Peiping to Tientsin.
6. Two-way radio telephone stations are to be established at the important sea-ports, islands, etc. as shown in the drawings prepared by the Ministry.

## The Proposed Water Purification Plant for Nanking

(Continued from page 286).

The cost of the above is estimated at 1,300,000.00 Chinese dollars in May 1929.

Gate-valves, check valves, self-closing valves, fire hydrants and public service hydrants are to be properly located. It is intended at the beginning to adopt the metering system to the consumers, in order to minimize waste and avoid future disputes between the waterworks and the consumers. The pressure in the piping system is expected to average 45 to 60 pound per square inch, according to the distance from the center of distribution.

**Reservoirs**

A concrete reservoir of 20,000 cubic meters is to be constructed at the works, and a balance reservoir with a capacity of 10,000

cubic meters to be located at the top of Ching-Liang Hill 52 meter above average level ground of the city.

The arrangement of valves will enable the reservoir on the hill to be used as distribution reservoir during the time of small consumption. The total storage capacity of the plant is above 30,000 cubic meter, 7,920,000 gallons, which would take up the peak load of the day easily without effecting the daily consumption.

**Cost of Construction of the Plant**

In May 1929, the cost of construction of the preliminary plant, designed to meet the first need of the people was estimated to be a little more than three million Chinese dollars. With the depreciation of silver, the cost will increase with the rate of exchange. The Municipal Government of Nanking has already taken the necessary measure to raise a supplementary sum for covering this deficit. In May, 1929, the costs for the different parts of the plant, were estimated as follows :

1. Power Plant and Auxiliary Machinery ..	\$310,000
1. Filter Equipments and Materials.. ..	210,000
1. Construction of Power House, Pump House Repair Shop and Other Buildings..	160,000
1. Concrete Structures, Reservoir, Basin, etc. .. .. .	510,000
1. Pipes.. .. .	1,300,000
1. Pipe Laying.. .. .	450,000
1. Miscellaneous .. .. .	60,000

Total (Chinese Dollars) .. .. \$3,000,000

With this amount, the construction works can be carried out by engaging different contractors and starting works simultaneously. Under normal conditions, the time of completion is estimated to be within two years.

**The Initial Construction Works**

The earth and foundation works were started at the end of March 1930. The filling of 75,600 cubic yards of earth will be completed towards the middle of May. The engineering staff is carrying on the work of testing piles and platform loading test in position to study the nature of soil. A wooden landing pier, and shore protection work would shortly be put into construction. The erection of Power house and pump houses, is expected to start at the end of May, and to finish towards the end of December.

**Personnel**

The waterworks plant was designed and proposed by Mr. E. Ginn, Commissioner of Nanking Waterworks, and Mr. S. C. Yew, Engineer-in-chief of Nanking Waterworks, assisted by their staff, Messrs. S. T. Chen, Q. F. Chow, and K. H. Wu.

**Siamese Railway Extensions**

(Continued from page 281).

there is little hope that the line will be built, owing to the fact that for many years it could not pay interest charges. In fact, the line would have to be operated at a loss of several lakhs of Rupees and under present financial conditions in India, the Burma Government has been compelled to retrench and cut down its railway program and utilize its funds for highway construction.

The Siamese Railway Ministry last year announced its decision to electrify the lines in the vicinity of Bangkok, but this scheme seems to have been side-tracked in favor of Diesel locomotive traction. Orders have been placed with Sulzer Brothers for six 450 H.P. Diesel locomotives and six 900 H.P. and one 1,400 H.P. Diesel locomotives with Friechs of Denmark. The Danish order runs, into several million Kroner. The 1,400 H.P. engine is said to be the largest actually in practical traffic use in any part of the world. The smaller Swiss Diesels are to be used for local traffic while the larger Danish units are for hauling long freight trains over the heavy gradients on the Korat section of the main line.

The Siamese State Railways will also place into operation in the near future the new coaching stock purchased from Cravens Railway Carriage & Wagon Works, Ltd., of Sheffield. These consist of eight first and third class composite cars.

# Shanghai, the Radio Central of China

By **GEORGE F. SHECKLEN**, American Adviser to the Chinese Government Radio Administration

**I**N America, in England, in France, in Germany and elsewhere the term "Radio Central" or its equivalent in other languages is coming into common use. By Radio Central is meant a central radio-telegraph office, or terminal, controlling several transmitters at one or more transmitting stations and automatically recording the signals from several receivers at one or more receiving stations, affording a varying number of radio channels between the central office and like terminals in distant countries.

During the past year China has had a modern Radio Central in the Sassoon Building, Shanghai, located in the very heart of the business and financial district, affording the fastest delivery and filing facilities possible. Somewhat more than 2,500 square-feet on the first floor is occupied by the most modern central office control and recording equipment. This section is the despatch and receiving office where radiograms are being dispatched to and received from all parts of the world, and where may be seen in operation the latest perforators, automatic transmitters, printers, recorders and telegraph typewriters. It is no exaggeration to say that no telegraph office in the world is equipped with more up-to-date apparatus.

On the ground floor is located the public office where radiograms for all places both domestic and foreign may be handed in by the public. Writing tables for the convenience of the patrons are distributed in front of the neatly designed counter over which the customer will be courteously informed by the clerks of rates, classes of radiograms accepted and routings.

Adjacent to this office is the delivery section where messages received from all parts of the world are made ready for delivery and despatched by a messenger force whose "esprit-d'corps" is rapidly drawing the attention of the business and general public alike.

In the mezzanine is located a modern accounting section which takes care of the abstracting, and billing of the hundreds of messages sent and received daily and arranges for settlements with connecting administrations.

## Transmitting Units

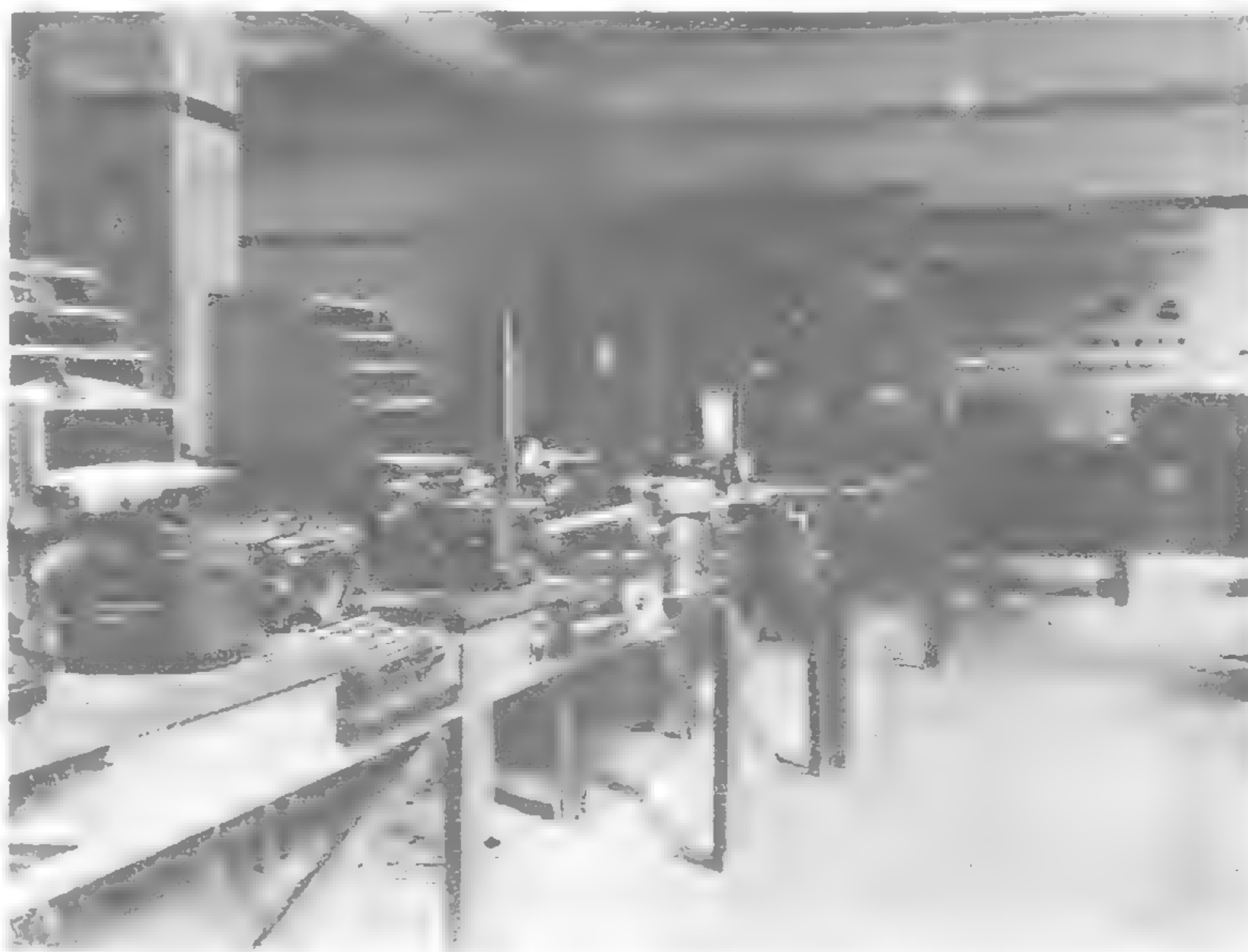
Up to the present : stations have been completed with one or more transmitters in operation at 565 Boulevard des Deux Re-publiques and several other locations in greater Shanghai, at Markham Road and at Feng-lin-chao. At Chen-ju, some seven miles west of Shanghai, there is in course of construction a transmitting station which will house two American RCA 20 kilowatt transmitters and one French 15 kilowatt transmitter which will transmit messages directly to San Francisco, Berlin and Paris without relay.

The Chen-ju station will be ready for operation this fall and will be capable of taking care of a great volume of American and European traffic.

## Receiving

Matching the Chen-ju station, there is being constructed a receiving station housing the latest in American and French receiving apparatus.

Liu-hong is the site of the receiving station about ten miles north of Shanghai. The Chen-ju and Liu-hong stations will be connected with the central office in Sassoon House by a 24 pair lead covered telephone cable affording automatic control of both the transmitters and receivers from the telegraph room of the Radio Central office. In other words, a radiogram perforated and passed through the auto transmitting machine in the telegraph office will be instantly recorded in San Francisco or Berlin as the case may be and radiograms sent from Berlin or Paris will be instantly recorded on the undulators in the same telegraph office—in fact



Shanghai Radio Central Office, Sassoon House R.C.A. Equipment in Foreground



Erecting Poles for the Berlin Antenna



San Francisco Antenna Nearly Completed

Liu-Hong Receiving Station, Shanghai Radio Central



Chen-ju Transmitting Station Near Shanghai, R.C.A. Transmitter Building, June 5, 1930

just across the table from the sending positions. Receiving stations in operation at present are located at 565 Boulevard des Deux Republiques, 151 Sinza Road and at Sassoon House.

### Chinese Administered and Operated

The Shanghai Radio Central is the product of forward looking Chinese who have not only planned the work but have carried on the construction and are administering and operating the system. That they have accepted the assistance and advice of German, French and American engineers and traffic experts in no way belittles their ability but rather indicates their keen desire to put into the



Chen-ju: Foundations for French Transmitter Building, June 5, 1930

project the best the world affords in the way of knowledge and equipment.

Responsible for the accomplishments and the carrying out of additional radio projects is the Chinese Government Radio Administration, is Dr. Wen Yu-ching. The Administration, now widely known as the CGRA, is a department of the Ministry of Communications and from Minister Wang Peh-chun and Mr. J. W. Chwang, Director General of Telegraphs and Telephones on down, the enthusiasm and effort to provide a real international, as well as domestic, service has been unequalled in any other public service project in China either by Chinese or foreigners.

## The Liege Tramway Circle

THIS tramway layout is a circle of unusual size and unique in its details, manufactured for the City of Liege, Belgium, by

The Lorain Steel Company and furnished through its export distributor, United States Steel Products Company. This photograph was taken in the layout yards at the manufacturer's plant, where the work was completely assembled, in spite of its large diameter, in order to insure accurate and speedy assembly of material on its arrival at Liege.

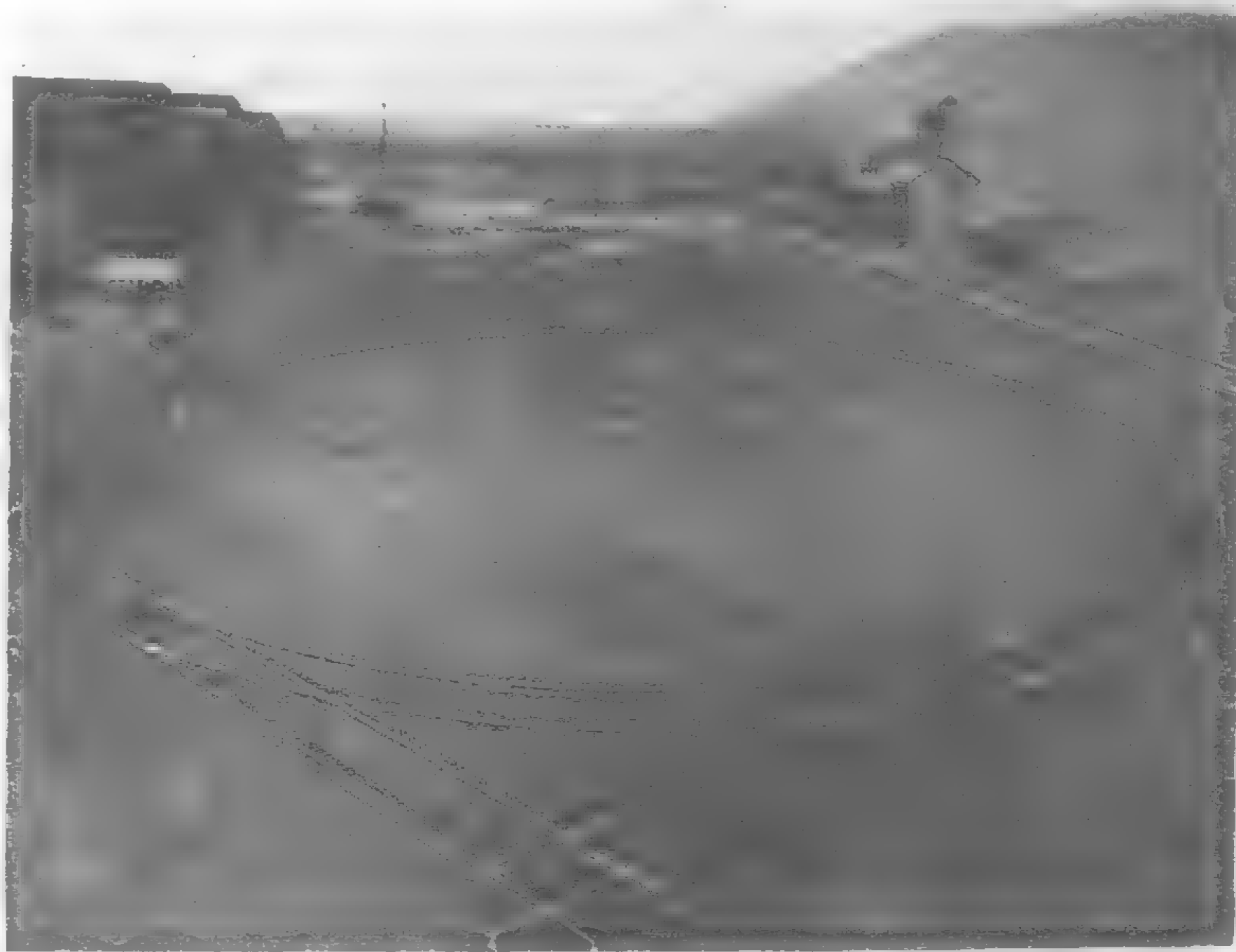
The circle has a radius of 22.5 meters. The Points and Crossings are of Chrome Nickel Steel. The connected Tongue Switches are of the well-known "Tadpole" or original Big Head type which has

never been surpassed and is almost universally recognized as the most efficient type of point on the market. The rolled, open-hearth connecting rails, also supplied by the Lorain Steel Company, were specially heat-treated to provide resistance against wear and corrugation.

This layout has now been installed and occupies an important position in the center of Liege. Cars belonging to both the Tramways Unifies de Liege et Extensions and the Railways Economique de Liege-Seraing will operate over this important junction. It will be a subject of considerable interest during the approaching International Tramway Exhibition soon to be held in Liege.



Tramway Circle in Process of Being Laid at City of Liege, Belgium, March 31, 1930



Liege Track Layout Shown at Manufacturer's Plant, The Lorain Steel Company, Johnstown, Pa.

# Chinese Government High-Power Broadcasting Station for Nanking

A Duplicate of the Oslo Station Erected by The Telefunken Company of Germany

**A**FTER many years of international friction over radio concessions in China, real progress is being made in linking the country up with the world communications systems. Much of the credit is due to the initiative of the Nationalist régime in entering into contracts for the erection of new stations which are now beginning to operate. Shanghai, the commercial and financial center of China is rapidly becoming a real Radio Center, while Nanking, the capital city, will have one of the most up-to-date and powerful Broadcasting Stations in Asia.

The erection of the new Chinese Government High-Power Broadcasting Station at Nanking is proceeding under the direction of the Telefunken engineers who hope to have it ready for service by the autumn of this year. The Nanking Station is a duplicate of the one supplied by the Telefunken Company of Germany to the Norwegian Government for its station at Oslo, the capital city of Norway. The Oslo station is situated five miles outside the capital at Lamberseter on top of the Eckberg hill, 545 feet above sea level. A description of this station in a recent bulletin of the Telefunken Company gives the full details of the installation and is therefore of interest as being identical with the station and equipment at Nanking.

The unmodulated telephony carrier wave power is 60 KW. The station building has a ground area of about 200 square yards and consists of cellar, ground-and first floor. In the cellar, are installed the re-cooling plant, store room and work shop. On the ground floor the rectifiers, converters and switchboards while the first floor contains the whole high frequency equipment and the main control switch-board.

Figs. 2 and 3 show the plans of the ground and the first floor. The building is situated between the two 490 feet high insulated iron masts, (Fig. 4.) distant from each other, 815 feet. The weight of one mast, including guys is about 45 tons. The antenna, stretched by counter weights, is of the T type and has a capacity of 1,850 cm and its natural vibration is 850 metres. The down lead, from the center of the horizontal part, enters from the side into the transmitting room. To protect the antenna lead-in insulators and wiring against excessive mechanical stresses a special device has been erected close to the building, as is to be seen on photograph 1. One is the buried ground copper wire, serving a ground connection for the transmitter. In addition a series of copper plates are placed in the ground around the building.

The transmitter is of the valve type consisting of four steps with a secondary circuit for a wave band of 450 to 510 metres, within which any wave length may be adjusted.

The present operating wave is 493.4m. The complete transmitting plant consists of four high frequency steps with modulator and a rectifier plant, supplied with the following valves:

Rectifier: twelve rectifying valves RG 221 (water cooled)  
Transmitter step I: one valve (2.5 KW.)

Transmitter step II: two valves (2.5 KW. each)

Transmitter step III: two water cooled valves 20 KW. each.

Transmitter step IV: fourteen water cooled valves 20 KW. each

Modulator: Three amplifying valves RV 230 and one valve RV 24 are used as a rectifier.

The converting plant consists of:

1. Filament generator for the transmitting valves in the steps I-III,
2. Filament generator for the transmitting valves of step IV and for the valves of the modulator.
3. Grid bias generator for the water cooled valves of step IV.
4. Plate generator for the speech amplifier.
5. Charging generator for the filament batteries of the speech amplifier and test apparatus.
6. Exciter for the fields of the generators.

As a safety precaution for every machine there is a spare machine which can be switched on immediately.

The energy required for the station is supplied by a three-phase power line of 5,000 Volts and 50 cycles.

The high tension equipment of the transmitter is thereby fed directly from the high tension mains and the converters, filament transformers etc. from a special transformer of 150 KVA with a secondary tension of 220 Volts. This last mentioned power transformer and a special transformer for lighting purposes of 10 KVA have been placed in the cellar of the building.

The high tension plant consists of six cells whereof one serves as spare. The cells contain the different switches, tension transformers, oil switches and the accessories for the different transformers and for the 400 KVA Plate transformer.

To the right of the high tension cells follows in one line eight switch-board panels for the converter plant.

Fig. 5 shows the front of the combined high tension and power switchboards and the converter plant.

For the cooling of the rectifiers and the valves of the transmitter steps III and



Fig. 1.—Front View of Transmitter Building



Oslo High Power Broadcast Station

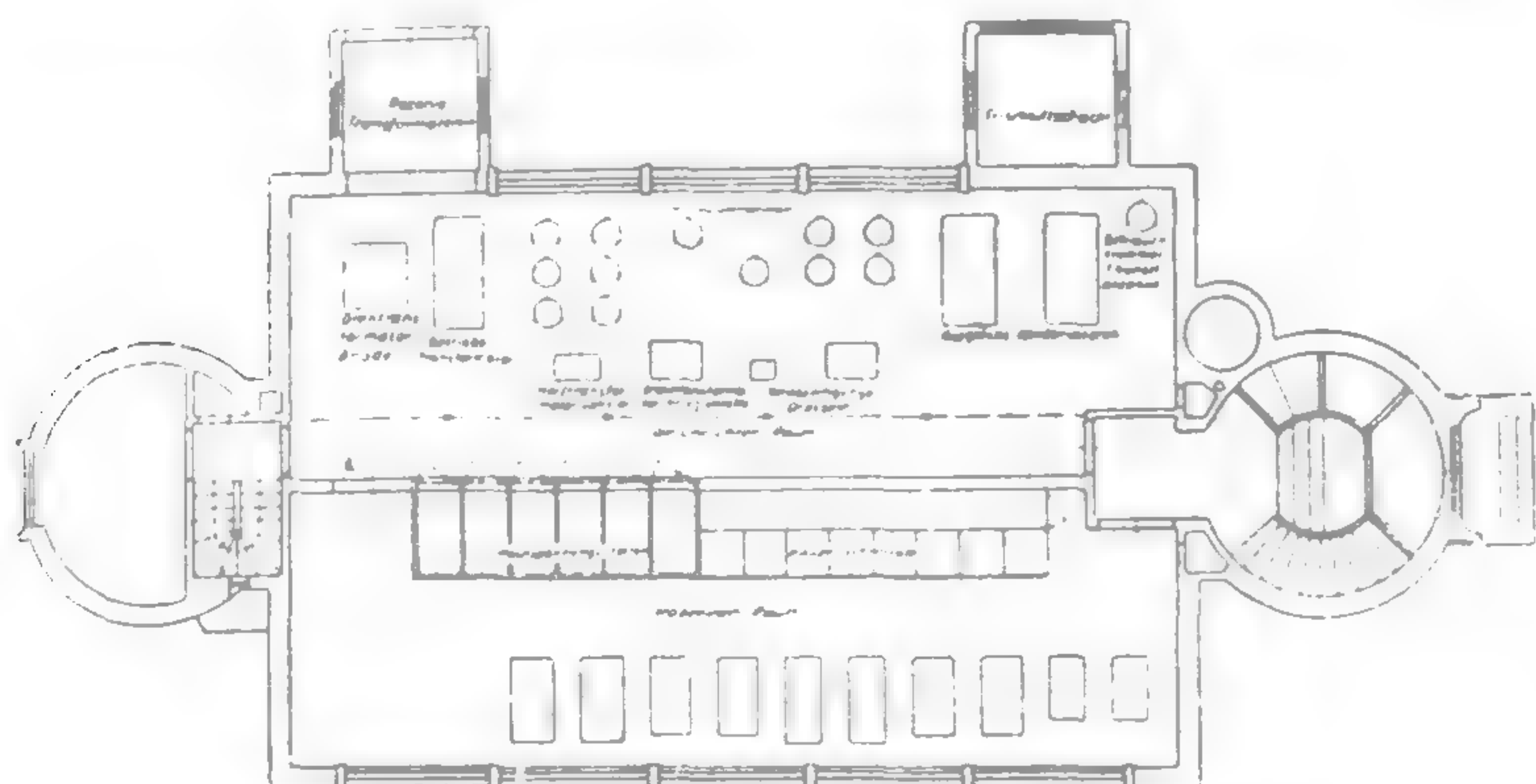


Fig. 2.—Ground Floor Plan

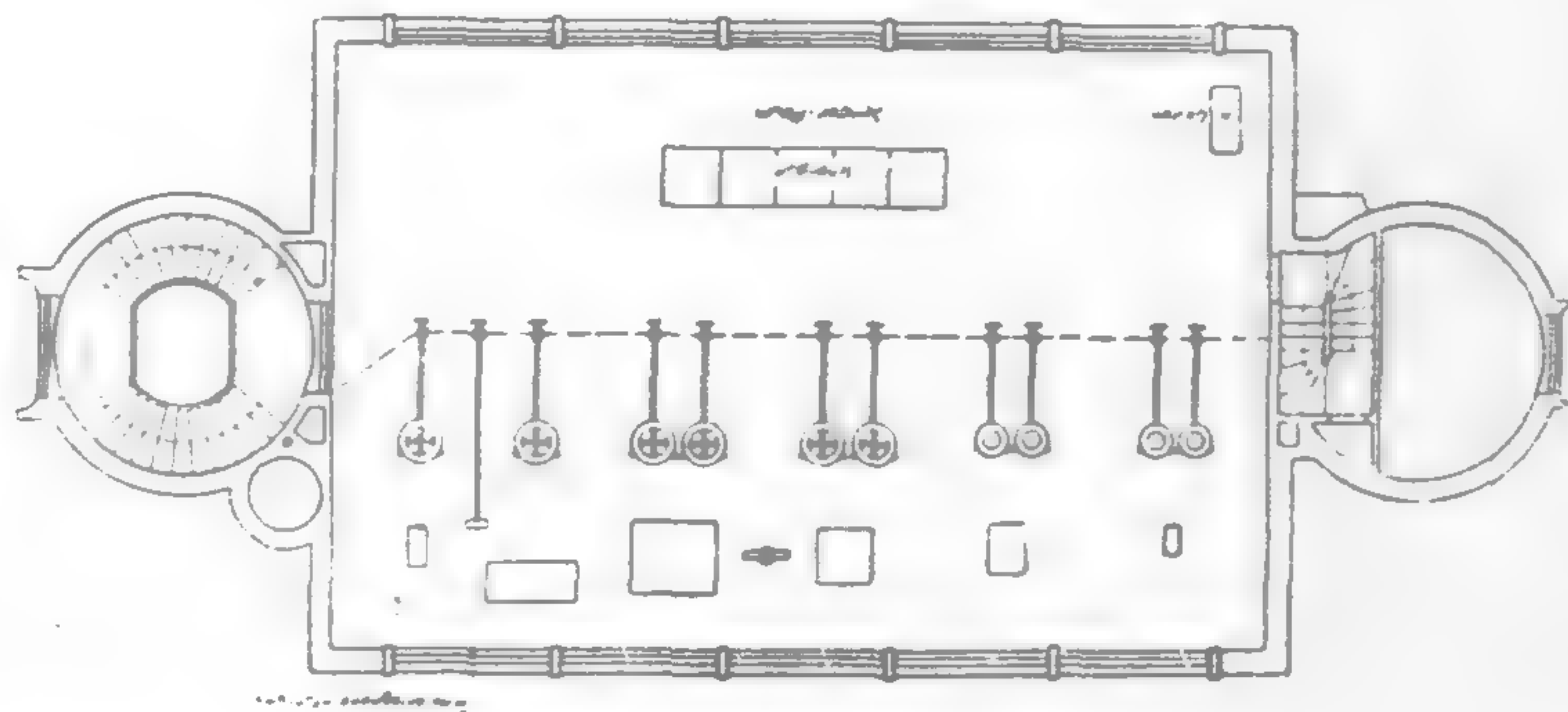


Fig. 3.—First Floor Plan

IV a water re-cooling plant is provided. Figs. 6 and 7 show the pumps and the exhauster of the water re-cooling plant.

The plate tension for the transmitter is taken from the three phase 5,000 Volts mains, after passing the valve rectifiers.

A special transformer the primary side of which is connected to the power mains and the secondary side to the rectifier arrangement transforms the main power tension to 12,000 Volts.



Fig. 4.—Transmitter Building and Antenna

The filaments of the rectifying valves are heated from the three-phase 220 Volts mains, using a transformer which reduces the tension to that suitable for the filaments. To be able to adjust this tension to the exact value required an induction regulator is connected in the circuit between the 220 Volts mains and the filament transformer.

For the supervision of the rectifier plant from the transmitting room, two instruments are mounted



Fig. 5.—Converter Room

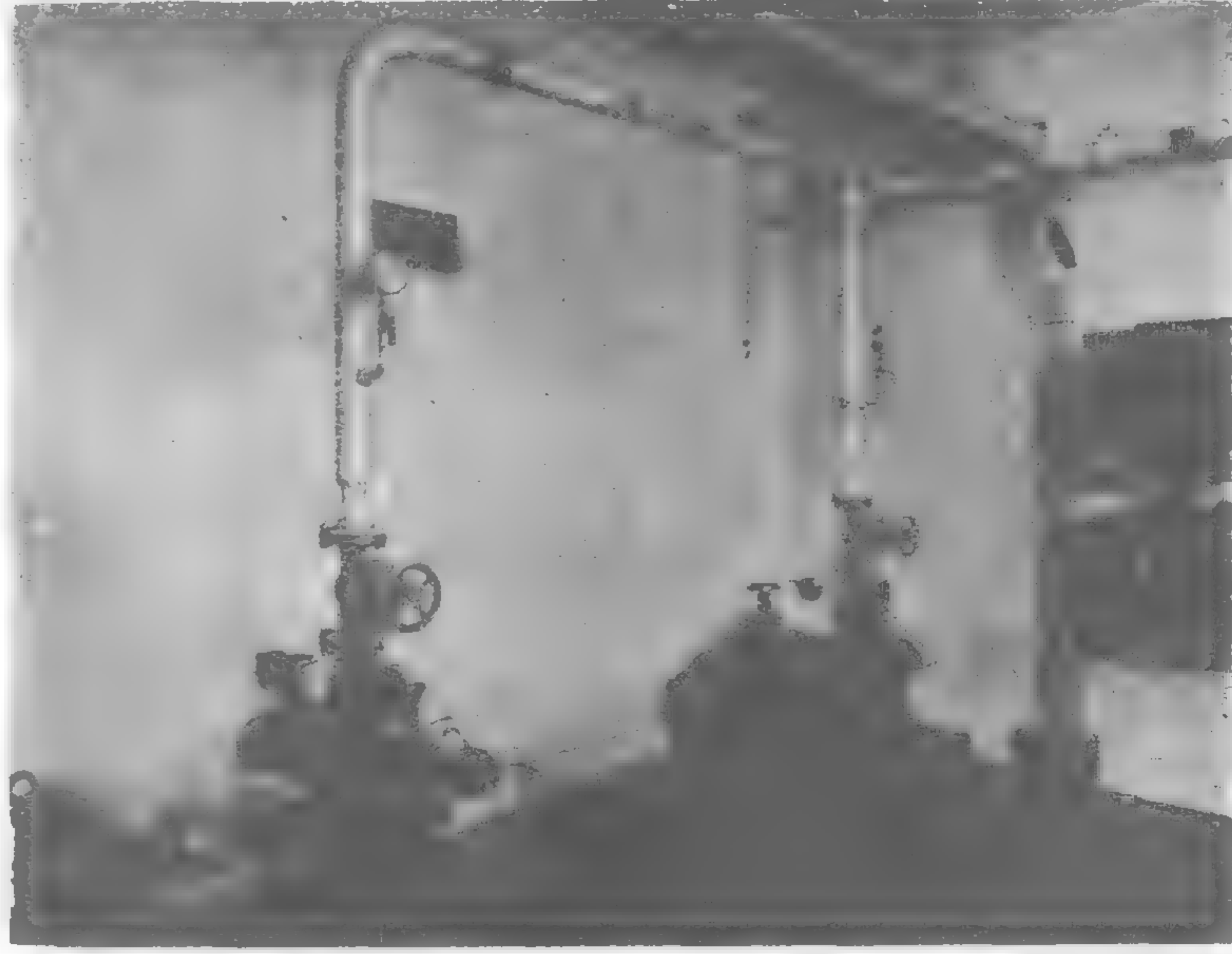


Fig. 6.—Re-cooling Pumps

By means of a induction regulator, connected in the circuit, it is, however, possible to vary the plate tension continually from 6,000 to 12,000 Volts. This is done automatically from the main controlling switchboard situated in the transmitter room.

A six phase rectifier is used whereby in every phase two rectifying valves are connected in parallel.

To smooth the pulsations of the alternating current, a filter consisting of a choke coil and two condensers is connected between rectifier and transmitter. The plate tension for steps I and II of the transmitter is taken off before the above mentioned filter and reduced to 10,000 Volts by means of a resistance. A separate filter is used for this tension.

on a special pillar viz. : one voltmeter for the plate tension and one ammeter for the current. The rectifying plant is to be seen in Figs. 8 and 9.

The first step of the transmitter, containing a 2.5 KW. valve, works as a self-excited oscillator. The oscillating circuit of this step consists of condenser and two coils in parallel one of which serves as a variometer for the exact tuning of the wave and the other for reaction coupling and for the coupling of the first step to the second step.

The two transmitting valves of 2.5 KW. in the seconds tep are connected to a similar oscillating circuit as that of the first step. The third transmitting step, where the modulation of the

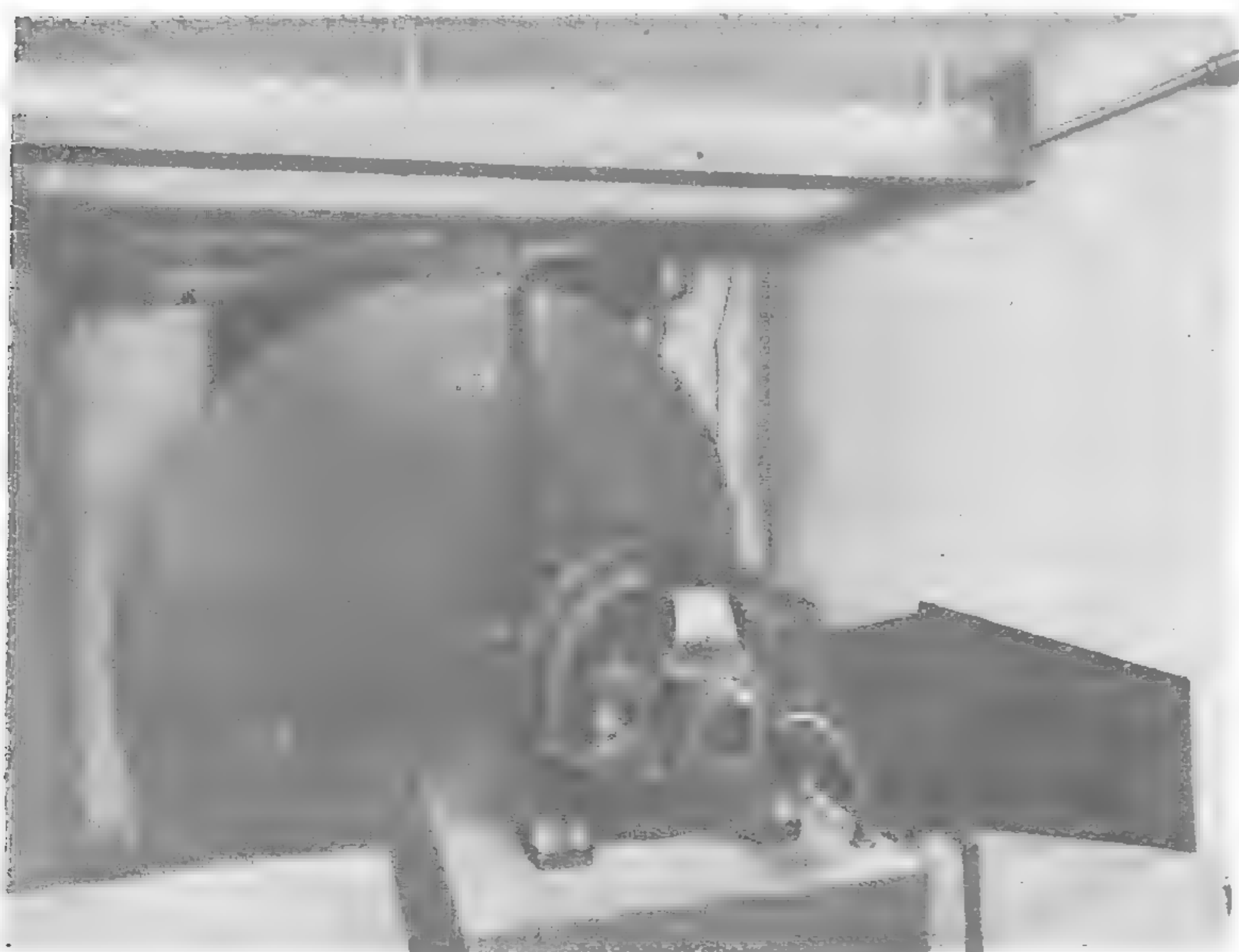


Fig. 7.—Exhauster for the Water Cooling Plant



Fig. 8.—Part View of Rectifier Plant

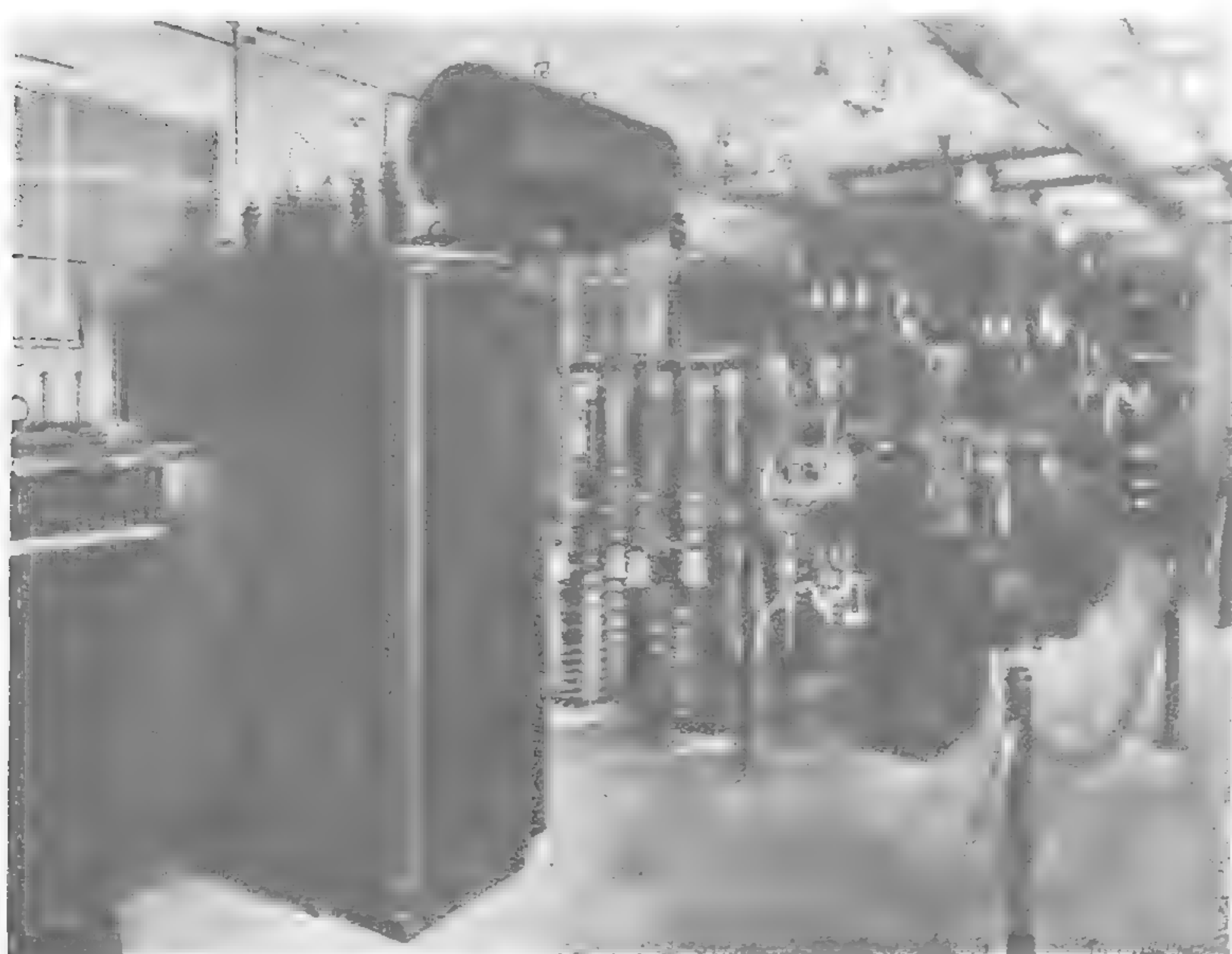


Fig. 9.—View of Rectifier Room

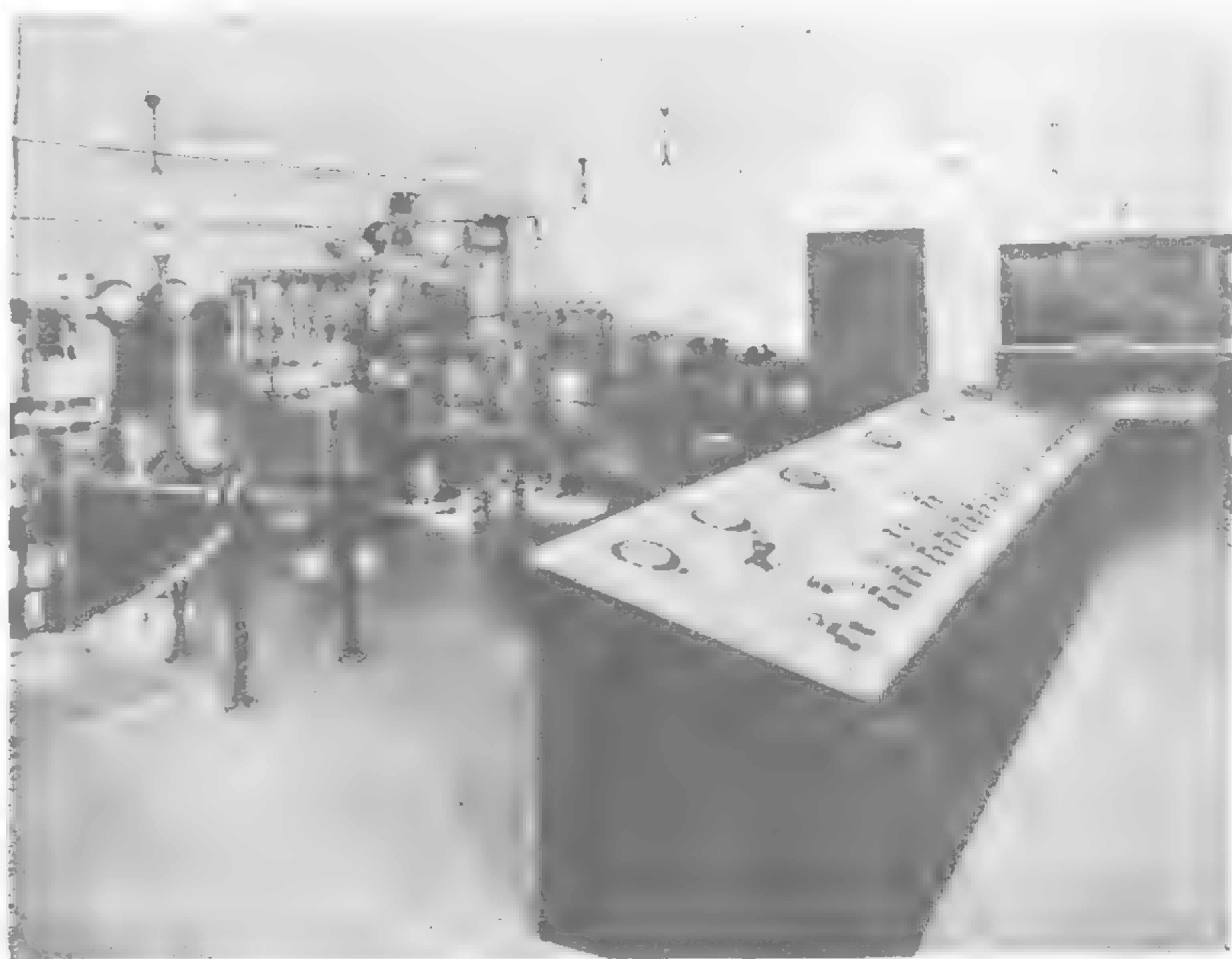


Fig. 10.—Main Control Switchboard and High Frequency Equipment

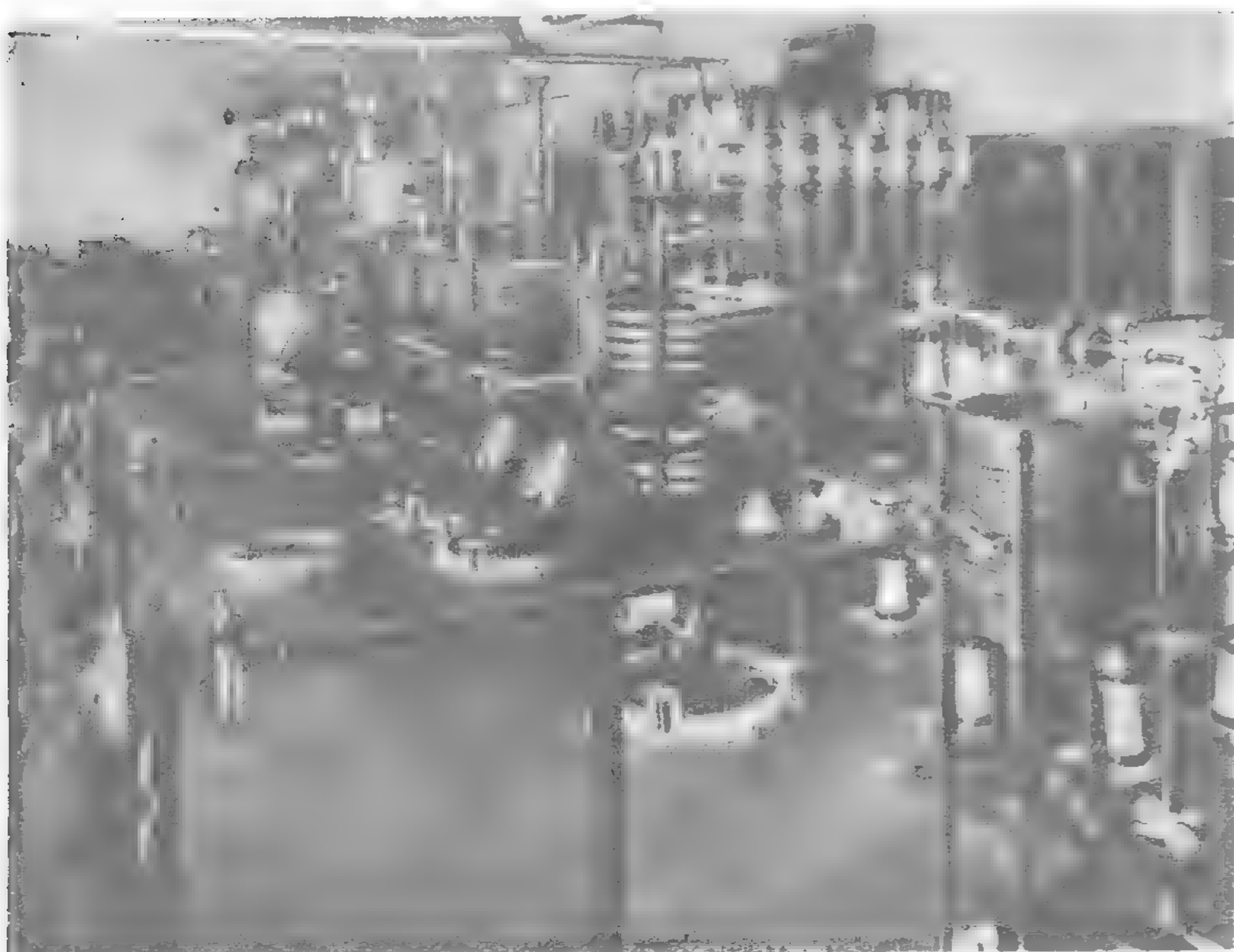


Fig. 11.—High Frequency Equipment



Fig. 13.—View into Amplifier Room of the Studio

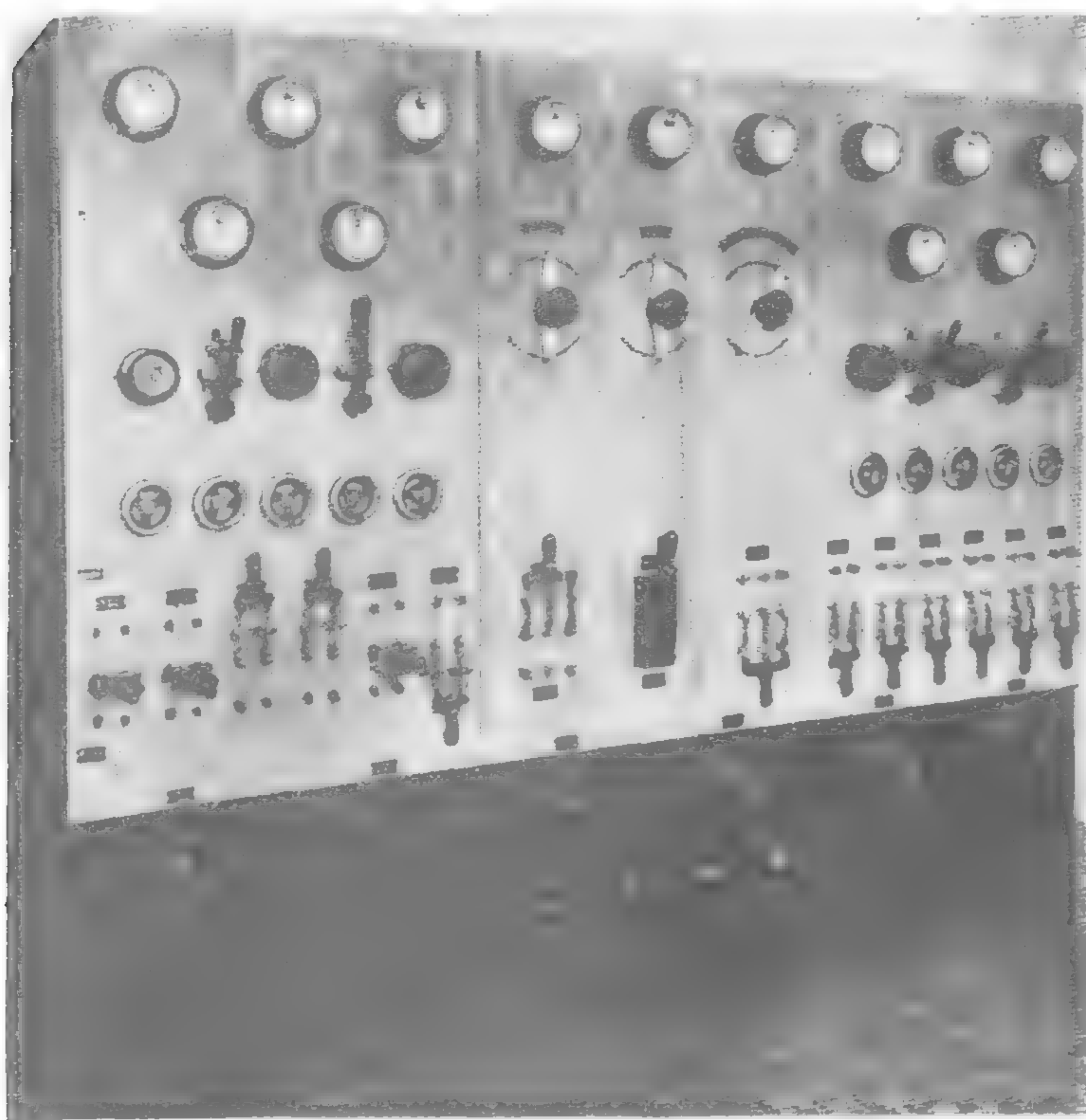


Fig. 14.—Charging Switchboard

transmitter takes place, is supplied with two water cooled valves of the 20 KW. type. The connection of the oscillating circuit of this step is the same as that of the second step.

The grid current modulation system is applied. Three valves connected in parallel is used for the modulator.

The required negative grid bias for these tubes is supplied by the first transmitting step using a transforming and one rectifying valve. In the fourth transmitting step there are 14 water cooled valves of the 20 KW. type. A direct current generator supplies the negative grid bias for those valves. A filter is connected in the D. C. generator circuit.

To reduce the emission of harmonics a secondary circuit is introduced between the power amplifier (fourth step) and the antenna. The coupling between power amplifier and the secondary circuit is inductively and between secondary circuit and antenna capacity. The antenna circuit consists of coupling condensers, variometers for tuning the antenna and shortening capacity. One antenna discharge coil discharges continually static electricity accumulated on the antenna. Furthermore a spark gap protects the transmitter during a lightning storm.

Much care has been taken in the arrangements of the wiring of the transmitter. Simplicity has as far as possible been introduced. All the different parts of the high tension, low and, high frequency circuits have been placed free in the transmitting room. The operator, therefore, may watch the whole transmitting apparatus from the main control switchboard.

Those instruments are absolutely necessary for tuning their supervision has been placed directly in front of the transmitter on special pillars. Figs. 10 and 11 show the high frequency part of the station. The main control switchboard may be seen on Fig. 10.

For purposes of tuning and adjustment the transmitter may work on dummy antenna. By means of a throw-over switch the dummy or the real antenna may be used. The transmitting station is connected to the studio, situated in the center of the capital, over a special broadcast cable. The building of the studio also contains an amplifying room containing the amplifiers, charging switchboards, etc. (Figs. 12 and 13). The charging switchboard for the batteries is shown on Fig. 14. At the end of the cable, on the transmitting station side, an amplifier including the necessary equipment, is placed. Listeners all over the continent agree that the clearness and modulation are exceptionally good. When the Nanking station is completed the same will be experienced by listeners in China.

## Filtration Plant at the Fushun Collieries

### An Interesting Installation in Southern Manchuria

IN connection with the enormous developments in mines, coke oven plant, iron and steel works, railways, power stations, docks and harbors, plant for the low temperature carbonization of shale, and other activities being carried out by the Southern Manchuria Railway, we are now able to give an interesting photograph



Filtration Plant at the Fushun Collieries

showing the water filtration plant for the Fushun Collieries and Fushun Water Works.

It will be remembered the site of the Fushun Collieries is in the Province of Fengtien, South Manchuria, about 20 to 25 miles east of Mukden, and to-day about 60,000 people are employed at Fushun, Japanese, Chinese and Koreans. Also the old and small

town of Fushun is already almost swallowed up by the open-cut mining operations, and a complete new town on the most modern lines has been built to accommodate 90,000 people, and it is largely in this connection as well as the Colliery that the Fushun Waterworks Company is operating. The plant was supplied in 1922 by the Paterson Engineering Co., Ltd., consisting of a rapid gravity filtration equipment to deal with 4,320,000 gallons of water per 24 hours, and capable of extension by a further 1,500,000 gallons in the immediate future. There is provided chemical reagent gear for the continuous addition of alumina and lime to the raw water as controlled automatically by the flow of the latter, using a venturi tube device, a reaction and precipitation tank to mix the reagents with the raw water, and six standard "Paterson" compressed air cleaned rapid gravity sand filters, each 24-ft. 0-in. by 12-ft. 0-in. The compressed air for cleaning the sand, that is by agitation for a very brief period to disentangle the separated impurities, followed by momentary reversal of the flow of the water, is provided by an electrically driven air compressor with air storage reservoir, the wash water being driven from the high pressure main leading to the Rikako reservoir. This standard principle of rapid sand filtration, as used in towns water supply, with coagulant treatment if necessary to remove all trace of coloring material, such as peaty acids, when the collecting area is large moorland, will undoubtedly find more and more use for industry, that is filtering and purifying the supply for the whole of the process work, and not the boiler plant only. Another example in the Far East is the "Paterson" plant which is on order for the Japanese Imperial Steel Works at Yawata (Island of Honshiu) with a capacity of 12,662,000 gallons per 24 hours and designed for extension to 19,000,000 gallons, while the Tata Iron and Steel Works at Jamshedpur in India have a similar installation.

# Greater Shanghai

## Building A New Port and City

THE Bureau of Public Construction of the Municipality of Greater Shanghai is looking ahead to the day when the International and French Settlements will be surrendered to Chinese sovereignty and the whole city administered as a single Chinese municipal unit. In planning for this future the Bueau invited architects to submit plans for a new civic center and street system for the greater metropolis and has awarded the following prizes :—

First prize	...	...	\$3,000	to	Chao Shen and Chao-sun Hsi-ming
Second prize	...	1,500	..	Moo Jen-yin	
Third prize	...	750	..	E. S. J. Phillips	
First mention	...	300	..	Poy G. Lee	
First mention	...	300	..	S. T. Hsu and C. K. Sze	
Mentions	...	100 each		P. S. Chu, H. L. Yang, and Shen Li-yuan	

In bestowing the awards, the judges said that competition showed a distinct advance over that held last year for the Nanking City-Planning scheme, but the competing architects had failed to appreciate the necessity for planning on a "monumental scale," such as the great future of the port called for. There was also a lack of appreciation of the full possibilities of Chinese architecture and knowledge of how to adapt it to the practical requirements of modern city-planning and construction, without sacrificing its essential aesthetic qualities.

In this, we believe the Chinese judges show a greater faith in the future of their city than many foreign experts. The westward trend of civilization and trade and the enormous possibilities for the development of China is destined to make Shanghai the

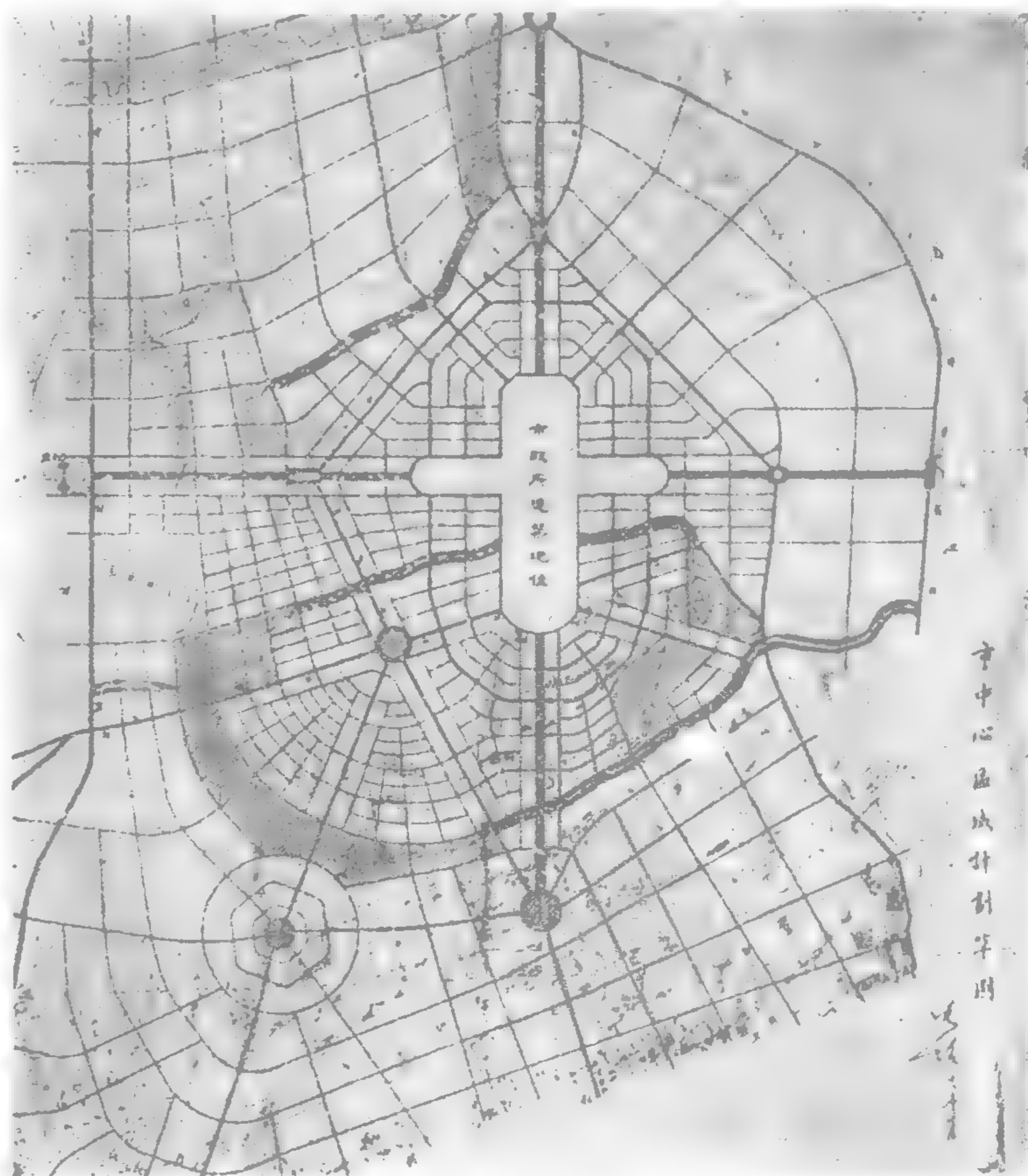
leading commercial center of the world within the present century.

The future status of Shanghai can be seriously discussed only after the cessation of internal warfare and the establishment of a strong central Chinese government capable of guaranteeing law and order and the equitable dispensation of justice. That day may be near or it may be distant, but when China's full sovereignty over the port of Shanghai is restored, the congery of International, French and Chinese municipalities will be brought under one administration. If the port is to properly fulfill its functions as the commercial and financial metropolis of a great nation, it must expand.

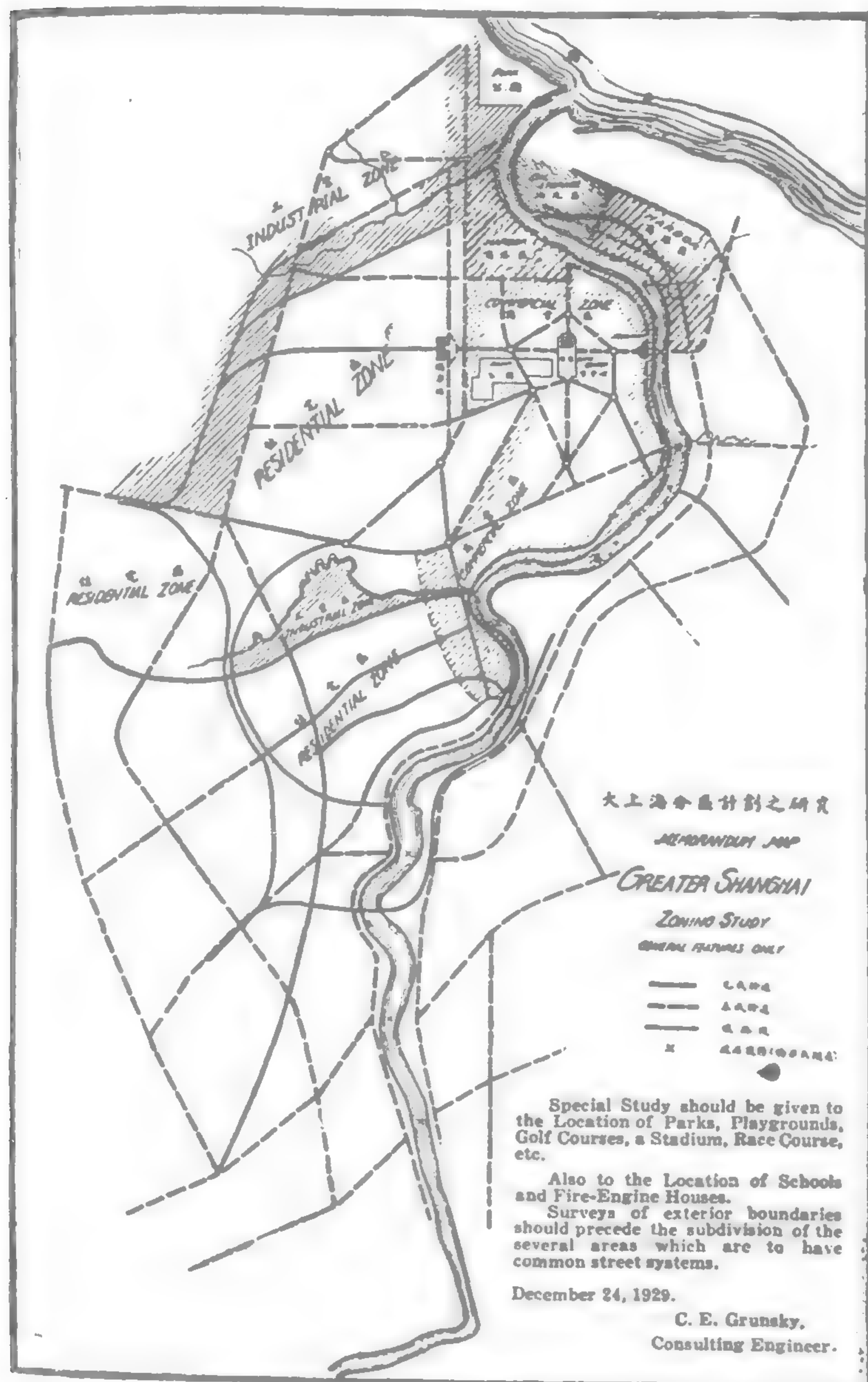
The Chinese very wisely have decided that this extension shall be along the Whangpoo River, taking in the vacant land between Woosung and the Point. The development of Shanghai cannot be permitted to follow its present westward trend as a purely residential city, but controlled in order to provide for its future usefulness as a port and industrial center.

The Chinese recognize that it may be many years before the International and French Settlements are handed over to their control and are drafting plans for a Greater Shanghai, quite independent of present conditions.

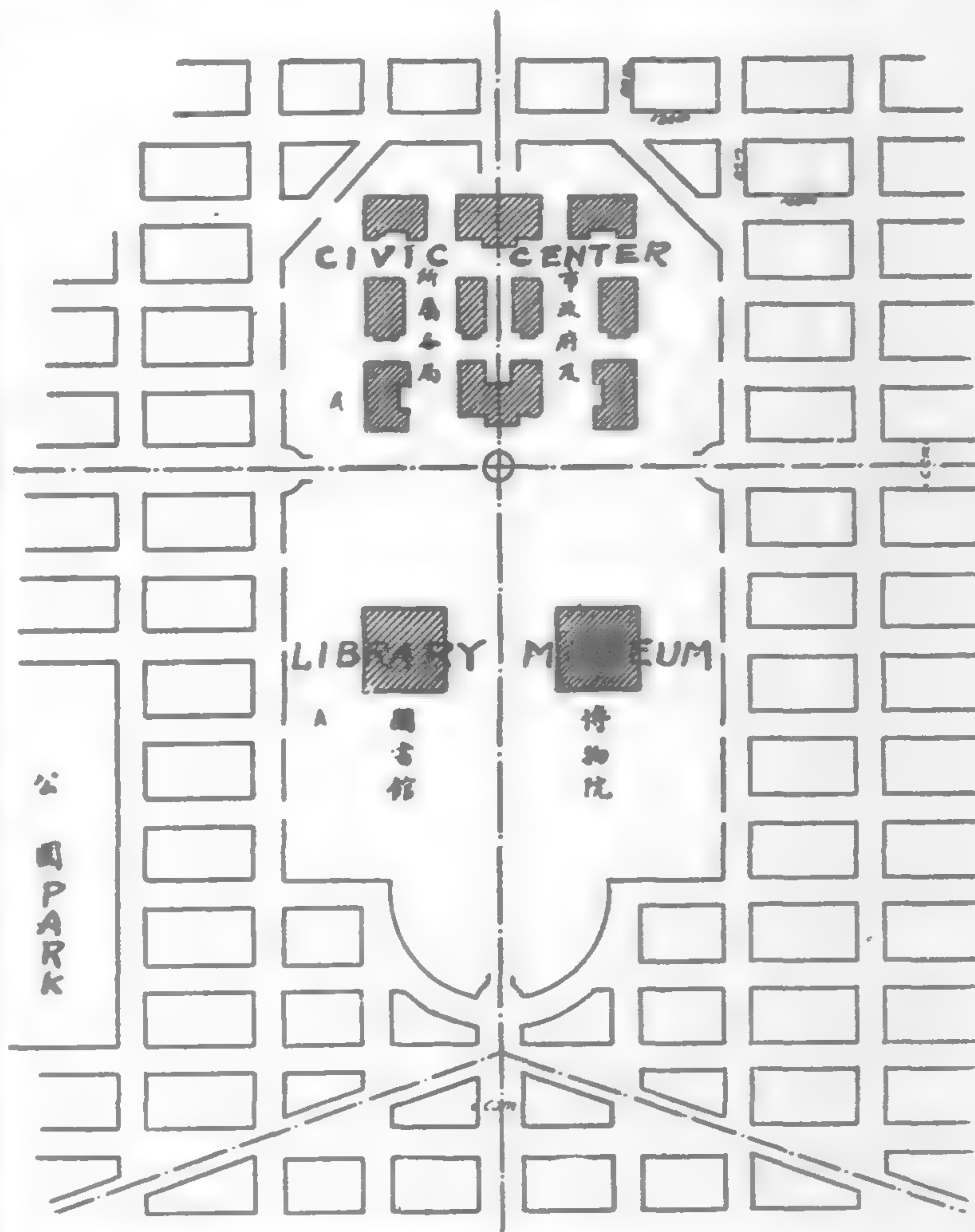
The new city will have its center at Woosung at the mouth of the Whangpoo River. A new business district will be built, a port and wharves constructed and the terminus of the Shanghai-Nanking and Shanghai-Hangchow-Ningpo Railway shifted from their present location and moved to Woosung. The following plans show the general layout of the proposed city and the civic center as designed by Mr. Chao Shen and Mr. Chao-sun Hsiming :—



The Chinese authorities invited Dr. C. E. Grunsky to come to Shanghai last year to make a special study of the Chinese plans for a Greater Shanghai, and suggest improvements. Dr. Grunsky's memorandum based on the Chinese plans makes very little changes on the general layout as will be seen from the following plan :



Note :—Streets should preferably be North and South and East and West.  
Where they cross thoroughfares or boulevards there will be occasional small open spaces which is a desirable feature.  
Acute and obtuse angles at these main highways will be less objectionable than many curved streets.



The area of the different edifices in the civic center are as follows:

The Municipality Government	...	10,000	square meters
Bureau of Public Safety	...	14,000	" "
Bureau of Public Utilities	...	7,000	" "
Bureau of Public Construction	...	7,000	" "
Bureau of Health	...	7,000	" "
Bureau of Education	...	7,000	" "
Bureau of Finance	...	6,000	" "
Bureau of Land	...	6,000	" "
Bureau of Social Affairs	...	7,000	" "
Bureau of Harbours	...	6,000	" "

Apparently, there has been no definite estimate of cost to carry out this gigantic scheme to build a new port and city. On its face it will require a sum that cannot be raised from foreign sources until China is once again on a sound financial basis. It is only another dream, but one that must come true, if Shanghai is to discharge its functions as the commercial metropolis of the most densely populated country in the world.

## Electric Auxiliary Propulsion's Wonderful Results

It was announced as far back as last October that the Ellerman liner, *City of Hongkong* had been equipped with the Metropolitan-Vickers system of auxiliary turbo-electric drive by Workman, Clark (1928) Limited. This was the first application of the system which was the invention of Mr. James Scott of Liverpool, who has developed it in conjunction with the manufacturers.

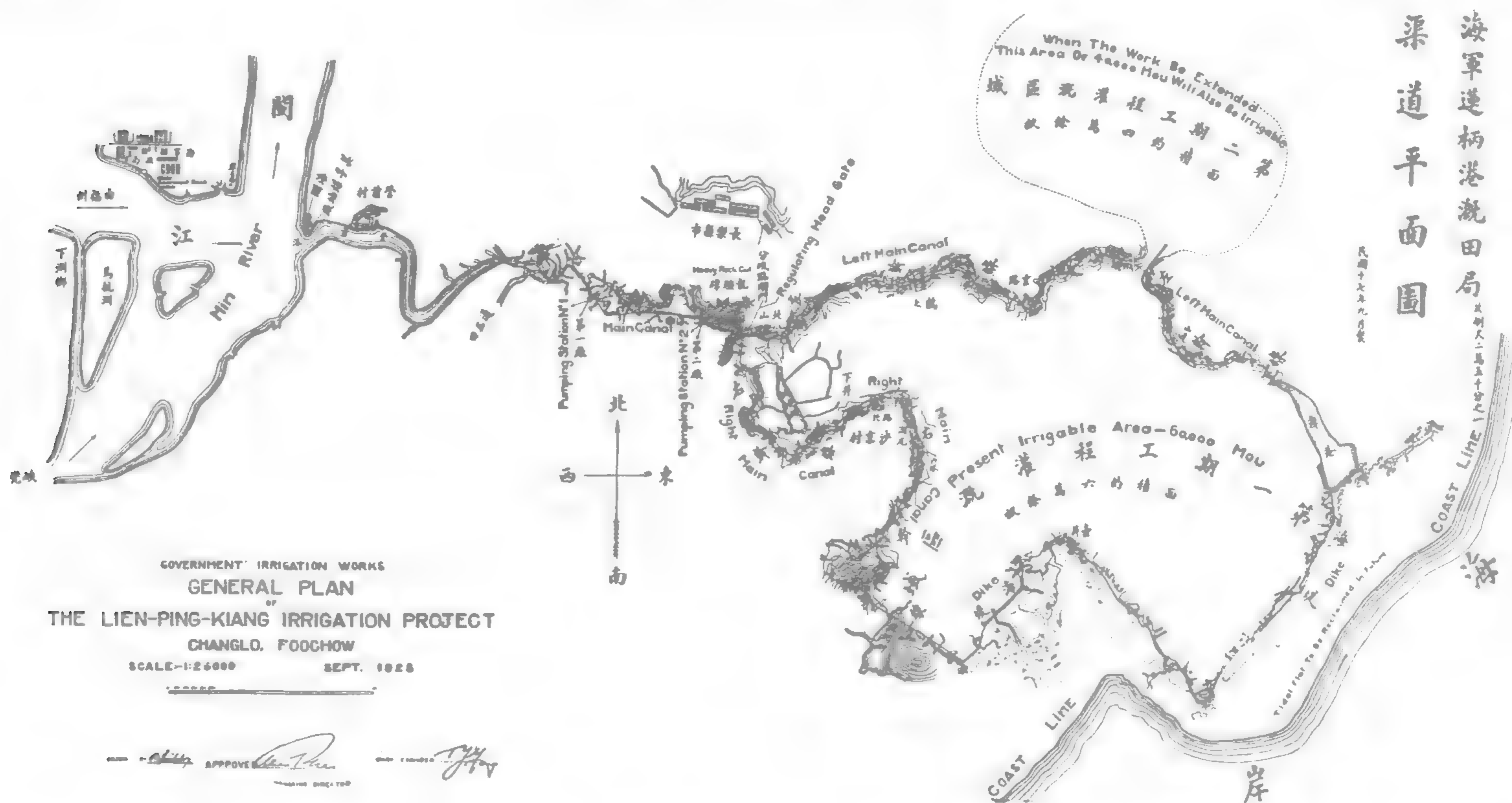
The equipment consists of a specially designed steam turbine which is driven by exhaust steam after it leaves the 1.p. cylinder of the main reciprocating engine. The turbine is directly coupled to an electric generator, the energy from which is absorbed in a specially designed electric motor which, in turn, is directly coupled to the propeller shafting.

Recently the *City of Hongkong* arrived in the Mersey after a round trip to India, and her fuel consumption and performance, as a result of the installation of the electrical equipment, shows a

saving of 27 per cent, as compared with previous voyages without the installation and under similar conditions. In the case of new ships further savings can be effected by driving all the auxiliaries from the generator. In addition to the economic gains so amply demonstrated, it has been shown that the system makes possible an exceptionally high and controllable degree of flexibility between the turbine and the propeller shaft. Even at reduced engine power, a large turbine output is obtainable.

The whole of the equipment is interconnected to the main engine. It is claimed to be automatic and fool-proof in operation, and does not require any addition to the engine room staff.

The designers believe that further economies can be effected by the introduction of fuel which, together with the improvements described above, should go a long way towards bringing coal into its own again as a serious competitor to oil.



# The Lien Ping Kiang Irrigation Scheme

## Fukien Province

Amongst the many signs of progress in China is the completion of the first stage of an important irrigation scheme in Fukien Province, along the lower reaches of Min River between Foochow and the sea. This is the first modern irrigation scheme to be put through by the Chinese authorities. The crop results of the first year of operation shows an increase of 233,000 piculs of rice. The following brief extracts from the lengthy official report on the scheme, will give some idea of the extent of the preliminary stage of the work. The financial results of this initial modern irrigation plant will be scrutinized very carefully by other Chinese communities and will pave the way for many similar schemes in other parts of the country, opening up a new important market for pumping plant, corrugated iron culverts and other foreign supplies.

THE imports of rice into China for the years 1926, 1927 and 1928 were 18,700,797, 21,091,586 and 12,656,254 piculs, respectively. From these figures it is evident that the production of rice in China is not sufficient to meet her needs. In tracing one of the major causes of this condition, the need for scientific agricultural methods becomes apparent, taking into consideration the excellence of the Chinese as a farmer and the intensive use to which the soil of this country is already put.

The importance of irrigation methods is only just beginning to be recognized at their true value in this country. The suggestion for digging an irrigation system at Lien Ping Kiang, a village in Fukien, is found in the Chinese classics at the time



Mamoi Waterworks Plant for the Lien Ping Kiang Irrigation Scheme; Equipped with Two Sulzer Limax Centrifugal Pumps, with Capacities for Pumping 44,100 Imperial Gallons per Minute, Coupled to Two Sulzer-Diesel Engines, 400 B.H.P. each

(Continued on page 304)

# Far Eastern Airways

SINCE the days before the Roman Empire great fleets of sailing vessels and caravans of camels pushed their way eastward over uncharted seas or deserts in quest of the treasures of the Orient: silks and pig iron came from China; spices from India. It was searching for new routes to Asia that led to Columbus's discovery of America.

The earliest routes by sea extended from the Levantine empires through the Red Sea and across the Indian Ocean. The land routes converged at Bagdad, thence through Persia to Turkestan. Bagdad, long forgotten in her relation to the Far East, is once more coming to the fore, this time as a center for Asian airways. The Magic Carpet of Bagdad is no longer a myth.

The Ottoman Empire closed the overland routes in the sixteenth century, yet the airplane proves again that there is nothing new in history, for where camels once plodded leisurely through desert sands, swift-winged machines now race through Oriental skies.

The first departure from the old routes came in 1898 with the completion of the Trans-Siberian Railway, which runs 6,000 miles across Europe and Asia from Moscow to Dairen. It is the longest railroad in the world. The steamship, however, following the old sailing routes now improved by the Suez Canal, still remains the chief means of transportation to the Far East.

We are now witnessing the dawn of a new age which bids fair to revolutionize the relations of the East and the West.

The first official mission to the Chinese Court was in 1793 when the British Earl of Macartney arrived in Taku bearing presents to the Chinese Emperor. The Chinese insisted these were tribute and hoisted flags over the ships bearing the inscription "Tribute Bearing Ships from England." More than one hundred years later the first airplane was welcomed by thousands of people with unstinted admiration and acclaim.

All of the larger countries have already sent their Marco Polos of the air, blazing air trails to the East. It is only a matter of time until America and Europe are brought to the threshold of Asia.

American pioneers have made outstanding flights to the Far East, but American plans for Asian air routes seem to be lagging. The United States Army Round-the-World flyers made the only flight to date from East to West; the feats of Brock and Schlee following the sea routes through

India, and Mears and Collyer following the Trans-Siberian route to Tokyo are still fresh in memory.

The Frenchman, D'Oisy, flew from Paris to Peking; De Ferrara came by air from Rome. Hinkler flew from England to Australia, while the British have also just completed a military flight to Australia and back to Singapore, when the planes are now in regular service. In 1926 the *Lufthansa* completed a flight from Tempelhof Airdrome to Peking.

The accomplishments of the Dutch require special mention. Last fall several Fokker *FVII-3m* machines flew from Amsterdam to Batavia, Java, covering the 8,750 miles on schedule in twelve days. Three of the Dutch pilots have successfully flown the 17,000 miles from Holland to the East Indies and return.

The territory of Asia is so vast and the European colonies so numerous that it will be more convenient to describe the present and projected activities of each country separately.

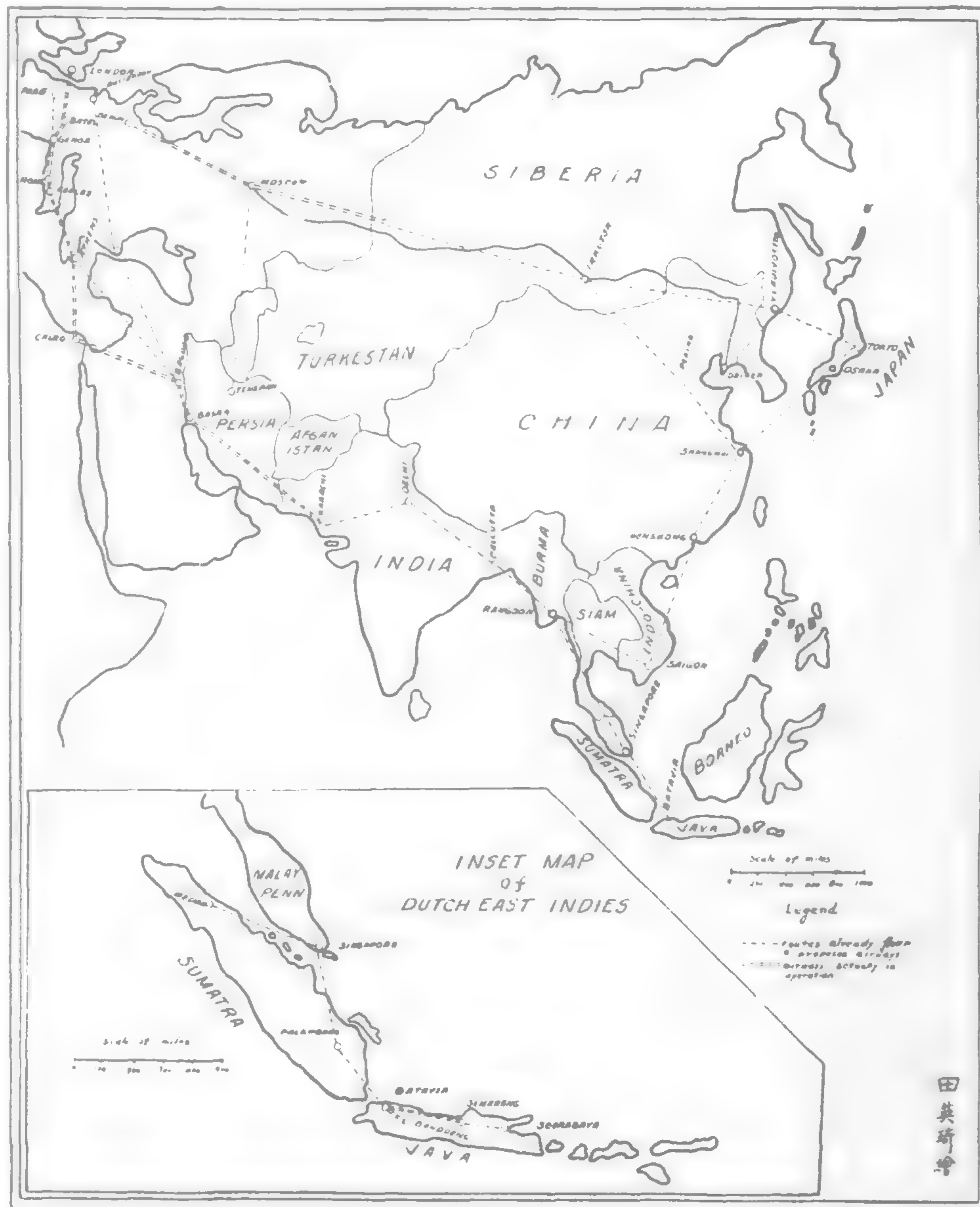
## British

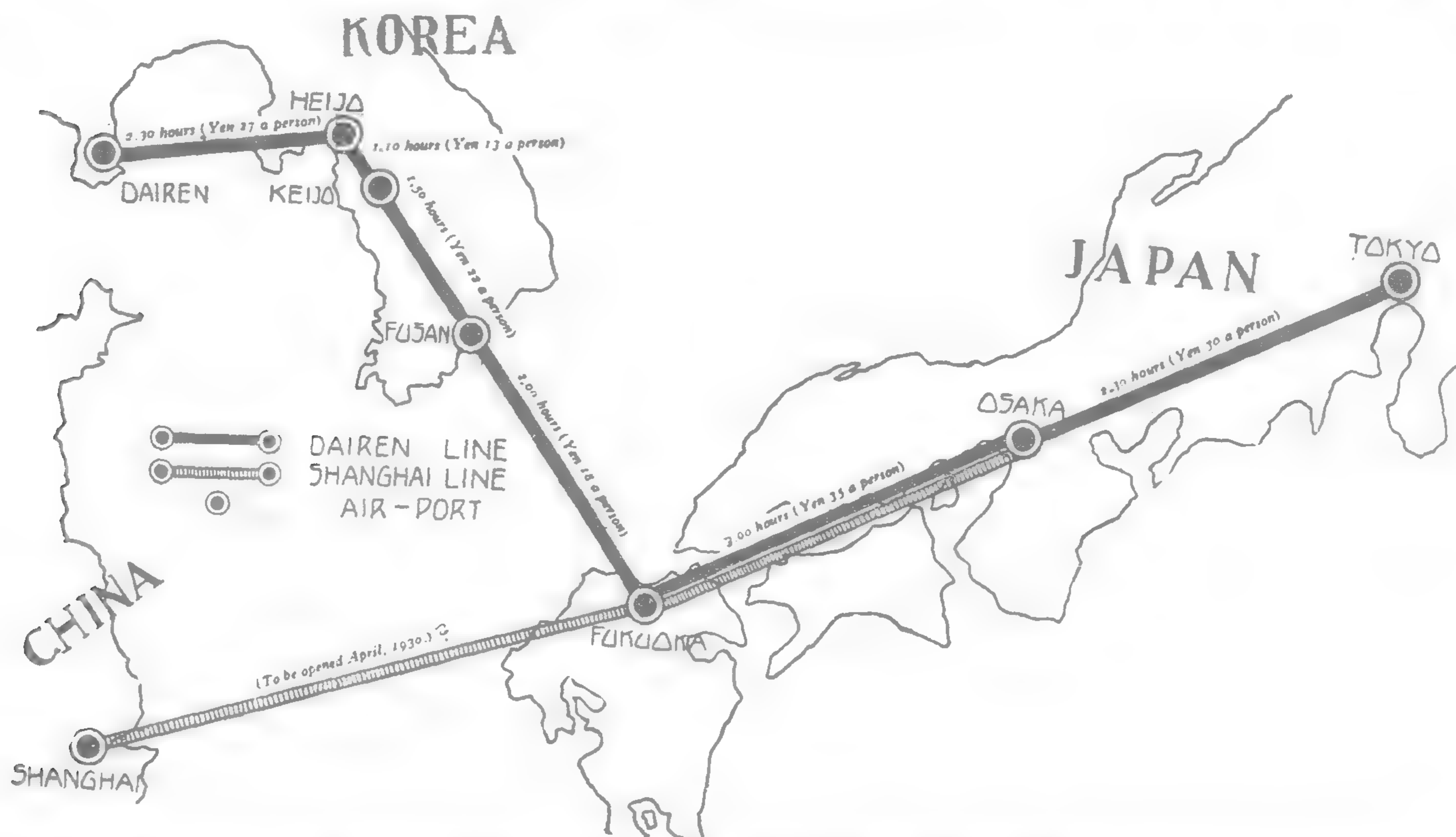
The political and commercial importance of binding India closer to England cannot be over-estimated. Proximity leads to understanding—had the English colonies in America been separated from the mother country by only a few days would not history tell a different tale?

By sea and rail it takes sixteen days for mail to travel from London to Delhi, the capital of India. The Imperial Airways route has reduced this time to nine days. The journey is made in stages, all flying being done by daylight. The first hop is from London to Basel thence by night train to Genoa, to avoid flying over the Alps. On the second stage one goes by seaplane from Genoa to Greece, Aboukhir and Cairo. From Cairo one goes in land planes to Bagdad and Basra. Two more days complete the air journey at Karachi. When night flying is perfected the entire journey will be made in only three days.

The new airplanes ordered for this route are specially designed Handley-Pages. Each will carry forty passengers, besides crew. These planes will be powered with four 500 h.p. engines and will be fitted with slotted wings.

The cost per passenger is \$650, which includes hotels and meals en route.





Air Service of the Japan Air Transport Company, Ltd., Maintaining Regular Weekly Services as follows: Japan-Osaka, 12 Round Trips; Osaka-Fukuoka, 9 Round Trips; Fukuoka-Keijo, 3 Round Trips; Keijo-Dairen, 3 Round Trips; Fukuoka-Shanghai, Test Trips Completer, Regular Service Not Yet Opened

The Indian Government, properly supporting the mother country, is preparing to subsidize a connecting service from Karachi to Delhi and on to Calcutta and Rangoon, the capital of Burma.

As Singapore is one of the busiest ports in the world and is also the center of Great Britain's Far Eastern defenses, an extension to Singapore will follow as a matter of course. Experimental flights to Australia herald a great aerial artery extending half way around the world from the Empire's heart to her far-flung dominions.

### Dutch

Already one of the most progressive areas in Asia, the Dutch East Indies to-day are the scene of the greatest commercial aviation activity in the Far East. The Nederlandish-Indische-Luchvaart-Maatschappi a year ago began regular inter-island air services. In return for a government subsidy of 300,000 florins in 1928 and 1,000,000 florins in 1929 the company is operating a daily two-way schedule between Batavia, the capital of Java, Bandoeng and Semarang. Extensions in the near future will be made to Sourabaya, and the organization of a new Java-Malay States-Sumatra line, touching at Batavia, Palembang, Singapore and Medan.

The Batavia-Bandoeng line carried 1,102 passengers during November and December alone. The fare for this seventy-mile



Side-view of the Three Engine Fokker Commercial Plane, Showing Clearly the Construction of the Engine-Nacelles

flight is 15 florins or about \$6.00 U. S. currency. The 250-mile flight to Semarang costs about \$30.00.

Joy riding in Java is a popular diversion, 1,400 passengers having made hops during November and December a year ago. Sundays only are reserved for these hops, missionaries notwithstanding.

### French

The French possessions in the Far East are farther from Europe in point of travel time than those of any other country, since to reach Saigon, the capital of Indo-China, one must pass by India and the Dutch East Indies.

The world's trade routes heretofore have been dominated by British or German shipping but France is now making desperate attempts to take the lead in the new merchant service in the air.

The French have recently concluded agreements with Italy which will give her authority to use the airdromes at Naples and Castelrosso. Her aerial route to Asia will be across Italy to Athens, thence to Bagdad and on to Indo-China. The ultimate extent of this route will include Chinese ports and Tokyo.



The First Three Engine Fokker Machine, Delivered to the Royal Dutch East Indian Air Lines (K.N.I.L.M.) for the Running of the Services on Java. The Aeroplane is Fitted with Three Siddeley Lynx Engines of 240 H.P. Each, Metal Propellers and Wheelbrakes



Keystone Loening Amphibian Six Passenger Airyacht, One of the Fleet of the China Airways Federal Incorporated Flying Regularly Between Shanghai and Hankow. These Planes are Motored with 525 H.P. Hornet Motors, and have Flown Over 200,000 Miles Since the Establishment of the Service Last Fall

### German-Russian

Since the Soviets are *persona non grata* in most parts of the world, including China for the moment, the German Lufthansa has combined with them in negotiating routes to eastern Asia. The routes will be largely across Russian territory, while the diplomatic procedure will be handled by the more favored Germans, to the mutual advantage of both.

The natural sphere of operations for Germany and Russia is overland across Siberia and to the north of China. The Trans-Siberian Railway affords a line of ground communication as a basis, and the strong Soviet influence in Outer Mongolia will facilitate the establishment of branch lines running southward from the railroad to Chinese cities.

Experimental flights to Irkutsk, near Lake Baikal in Siberia, have been successfully made. If the present negotiations are successful a line from Berlin to Shanghai following the railway route to Irkutsk, thence southward, will be established. Flying only by daylight the journey will be completed in six days, in contrast to fifteen days *via* the railway, or thirty-five by boat.

The Russians have already speeded up the Trans-Siberian journey by an air service connection with the railway between Moscow and the Ural Mountains. Projects contemplated in Moscow include an all-Russian air line to Tokyo *via* Irkutsk and Vladivostok. As the Soviet government has been recognized by Japan, the most serious difficulty likely to be encountered by this line would seem to be in the forty-below-zero temperature which prevails over most of Siberia during the winter months.

A line from Moscow to Teheran, capital of Persia, is also planned by the Russians, who are active in combating British influence in the realms of the Shah.

The Germans have talked of an all-German Zeppelin line from Berlin to China but no definite progress has been announced. However, characteristic of German efficiency, the Lufthansa representative in China has published numerous pamphlets in the Chinese language in order to enlist the support of the growing masses who wish to keep up with the times.

### United States

The notable fact about nearly all of the air projects in the Far East is their dependency on government subsidies. That the American aeronautical industry stands on its own feet has been repeatedly pointed out at home and although American-Asian airways are scarcely more than in the dream stage, nevertheless when the time comes they may find themselves in a sounder position than earlier established foreign lines dependent on political patronage and subject to interference.

There are at least three good reasons why European developed lines have come to the Far East first.

Except for an almost all-ocean route of four thousand miles the only route to Asia from America is *via* Alaska and Soviet

Siberia. As the radius of action of airplanes increases and when the United States and Russia conclude the proper treaties, then the first reason for the delay will be eliminated.

The American possessions in the Far East consist solely of the Philippine Islands, and our policy with regard to them has been an uncertain one. On the other hand, the colonies of England, Holland and France are in every case larger than the mother country herself while the respective governmental policies have been carried on with purposeful stability.

A third reason for American indifference to aerial pathways to Asia comes from the tremendous growth of the industry at home—we have had all we could do in our own back yard without coming across the Pacific Ocean.

The first definite signs of a desire to include Asia in our aeronautical clientele has come with the agreement recently obtained last March from the Chinese Nationalist Government by Aviation Exploration Inc. (a Curtiss subsidiary). This contemplates establishing a network of air lines throughout China, using American airplanes and American pilots.

However, even during the boom year at home, in 1928 the United States exported twenty-five airplanes to the Far East, including Australia. The value of airplanes, engines and spare parts (not including tires) so exported amounted to \$504,918.

Although emphasis has been laid on the developments made by Occidental nations in Asia, the progress of autonomous Oriental countries should not be forgotten.

### Chinese

In previous articles in this magazine the aeronautical situation in China has been outlined. The China Airways, operating organization of the Aviation Exploration Inc. mentioned above, has brought its staff to China and is already efficiently running a fleet of Loening Airyachts between Shanghai and Hankow. In the very near future extensions are to be made to Peking and Canton.

An examination of the personnel of this company leads one to believe that no pains have been spared to insure the success of this enterprise. Mr. E. B. Price, former U. S. Consul in Nanking, is the president. His experience in China will prove a valuable asset. Messrs. Fries and Hamilton, the vice-presidents, and Mr. Harry G. Smith, famous air mail pilot and operations manager, are rapidly becoming inured to the use of chopsticks and Chinese tea after many long hours of negotiations toward smoothing out the local details of management. Birds' nest soup undoubtedly has been a favorite dish of these aviators, but whether or not any sharks' fin have been encountered is not known.

### Japanese

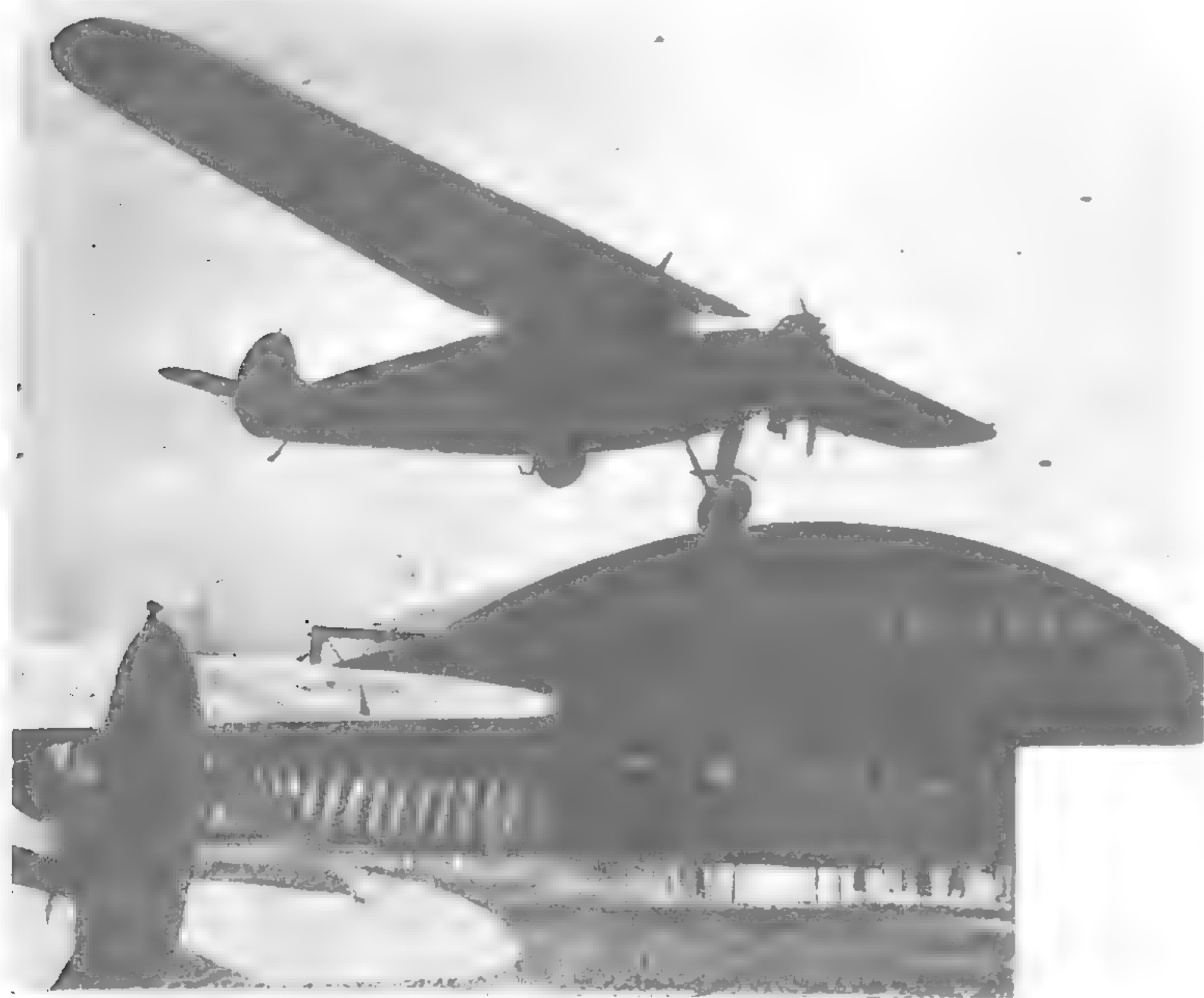
The Japanese seem handicapped in commercial development in the air due to a lack of engineering skill and shortage of proper materials. The Empire being efficiently served by railroads, her



Plane Manufactured by the Mitsubishi Aircraft Company

colonies not yet fully developed, and the recent anti-Japanese agitation in China, all have been factors in her lack of aeronautical progress. In addition, Japanese terrain is largely mountainous, the remainder being cultivated in tiny sections, each field divided from the other by a stone-retaining wall. To the casual observer, golf courses seem to be the only landing fields available.

Last fall Captain Abe, of the Japan Air Transportation Company, inaugurated a passenger and air mail line between Osaka and Shanghai. Translations of the propaganda signs which litter every available wall space in China are a good insight into why no further developments have been made. The sides of an ancient temple are daubed with hieroglyphics which demand "quick death to the Japanese;" school children scribble on the hutung walls "*jih pen shih wang pa tan*"—"Japan is a turtle egg," hardly offensive to our ears but one of the worst epithets in the Chinese language.



Planes and Hangar of the Japan Air Transport Company

On April 1, 1929 (the date apparently has no significance in Japan), airmail service between Tokyo, Osaka and Fukuoka was begun.

Last year Japanese military planes flew to Tientsin *via* Dairen, establishing a friendly airdrome near that of our own marines, then in China. Thus a chance was afforded to get together and find that airmen are much the same in spirit throughout the world.

### New Aviation School in Shanghai

Mr. G. W. Brophy, former United States Army aviator, representing the Detroit Aircraft Corporation, which controls the Ryan Aircraft Corporation, Lockheed Aircraft, Park's Air College, Eastman Aircraft Corporation, Aircraft Development Corporation, Marine Aircraft, Grosse Ile Airport Aircraft Parts Co, and the Detroit Aircraft and Export Corporation, has joined W. E. Gale & Company of Shanghai as their chief test pilot in charge of the Sales Department, and head instructor of an aviation school which the Gale Company will shortly establish to train Chinese students the art of flying.

Captain G. W. Brophy, Head  
of Gale Aviation School

### Siamese

Siam alone remains an independent kingdom in southern Asia. This interesting little country, famous for her white elephants, has proven her equality with western powers in keeping up with the times.

Her country, largely covered with jungle, through which other means of transportation are extremely difficult and slow, is served throughout by an air mail service. Her military air force is a model of efficiency, several Siamese air officers having been trained in the United States Air Corps schools.

(Continued on 303)

## Aviation in South China

CHINA presents a virgin territory for transportation system; but there is some difference of opinion as to what particular type will best suit the need of the country. One group favors railways, another advocates a nation-wide road-building program, while other experts consider that a network of both railways and highways should link the important commercial cities. In the meantime, especially in South China, modern transportation facilities may be said to be non-existent. There are not more than three hundred miles of railways and practically no inter-urban highways and the only modern means of forwarding

freight or mails any distance into interior is by small river craft. The opportunities for the development of aerial transportation in such a territory are numerous.

Aviation in China is by no means a new step in the advancement of modern civilization. As far back as 1911 there were a number of young Chinese learning to fly. The two most famous of these were Mr. Tom Gunn and Mr. Lam Yu Fuk. Unfortunately Tom Gunn was killed in a flying accident, but Mr. Lam is still flying.

In spite of the early start made by Chinese aviators actual progress has been slow. It was not till recent years that real

efforts were made in Canton to introduce flying, both for military and commercial purposes. In January, 1928, at the Taishatua Aerodrome, there were six airplanes—four old American army J. N.'s with Curtis OX5 motors, one De Havilland, with Liberty motor, and one other of French manufacture. Since then 34 aircraft have been acquired, 17 of French make, two that were turned out in England, besides 10 British Avro-Avians, and five American training planes.

All these years that they had been denied the use of swift-flying craft, provided with devices that make flying really safe, the skilful birdsmen of Canton's air force had been going ahead quietly, training young men in the art of aviation, but to make many long flights was out of the question. As soon as they had a few dependable machines, though, they exhibit a skill that made their fellow-citizens all over China sit up and rub their eyes. The two flights up north alone awakened an enthusiasm in this branch of modern progress that has led to the formation of several commercial air line companies, and to the purchase of planes in various parts of China. Canton has set the pace, and other communities of China are rapidly falling in line.

The policy in Canton has been a wise one. They have placed the greatest importance on the training of Chinese pilots, realizing that it was useless to establish aerial services, either military or civilian, until they had the necessary pilots to operate them. This policy resulted in the establishment of the Kwang-tung Aviation School, at Taishatua Aerodrome, Canton, under the command of Colonel Chau Po-hang. This school is equipped with Avro-Avian machines fitted with Cirrus engines, and the work of training is progressing steadily. There are about 150 young men enrolled. All have to take fifteen months' instruction, which consists of lecture courses and practical work. At the conclusion of the term, those who aspire to win their spur as full-fledged airmen go aloft, show their skill in taking-off and landing, and must do a "split S," and the "Immelmann turn" before they are handed their licences.

Fifteen instructors, most of them foreign-trained, are on the staff of the School. There are close to 25 skilled pilots in the air force, as well as several scores who have had some training, but because of insufficient experience are not allowed to go up in any but training planes.

Atmospheric conditions in Canton are not the best in the world. Their isinclined to be "bumpy," and lack of accurate meteorological information is another factor that makes it dangerous at times to go any distance from the aerodrome. For the most part, the flyers are restricted to rather narrow limits. Still, landing fields have been established at Wuchow, Nanning, Pakhoi, Shuichow and Samshui, and occasional visits are made to one or another of these cities by the more skilled birdmen. Until recently, none of the flyers carried parachutes. The government of late has been more liberal, and provided for the purchase of a number of parachutes of the most approved type.

While the air service has acquired both land and seaplanes, the latter, or better still amphibians, are probably much better adapted to local conditions than are land type. In the delta region, in case a pilot has to make a forced landing, he can be almost certain that he can come down to a river or canal. But if he must bring his machine to rest on a level tract of ground, he may have a hard time in finding such a spot.

South China's interest in aviation is by no means monopolized by the military circle. Private citizens are eager to start commercial companies to carry passengers, parcels and mails, and the plans for such companies have been drawn up. In addition to this, flying clubs are in existence both at Hongkong and Canton, which are reported to have a large and enthusiastic membership. They are supported financially by members' fees, private subscriptions and voluntary contributions. Experts are available to teach those desirous of learning to fly, and every effort is made to promote a general interest in aviation. There is no doubt that the activities of these organizations will lead to considerable private flying.

Rumor of an air mail service between Canton and Shanghai, flying two machines at the start, has been current. Stops will be made at Canton, Swatow, Foochow and Shanghai, the total equipment to cost \$85,000.00. But this route is still in the planning stage. There is also reported that British interests are planning a similar service between Hongkong and Shanghai.

Experienced airmen believe that the Hankow-Canton route will eventually be the best paying one. At present, however, even a company with machines flying between two cities would most

likely have to take a loss at the beginning. It has been estimated that it costs \$85.00 (Hongkong currency) per hour to operate a mail service, including overhead expenses, such as reserve for depreciation, replacement, salaries, fuel, etc., but exclusive of the cost of maintaining landing fields. Accordingly, about 250 lbs. of mail at \$10 (Hongkong currency) per ounce, would have to be carried by a plane if a Hankow-Canton route were to be put on a paying basis.

It is also contemplated to establish a China-Japan air line. Indeed, as often been pointed out by experts, the Orient presents a better field than does Europe for air mail services. China, Japan, the Philippine Islands, French Indo-China, the Netherlands East Indies, and the Federated Malay States all present thickly populated and wealthy territories either separated by short stretches of water or, where contiguous, not linked up by railways or roads. Considerable delays would be obviated if air services between these countries existed.

If this extensive system of airways were inaugurated in the Far East, Canton would be an important point on account of its central position, excellent harbor and landing fields, and its long-standing connection with all branches of international trade and transportation. Her position as a base of steamship companies along the China coast is a guarantee that this would follow any such development, and already numerous local interests have evidenced their intention of participating in the future operation of aircraft.

YIH CHIH-VEN.

## Far Eastern Airways

(Continued from 302)

Having no colonies Siam is content with the development of her internal air routes.

The population statistics of our west coast ports since American financial interests began demanding a share in the business of Asia's billion of population are only a foreshadowing of what bringing Asia to our doorsteps may mean. It has been said that "...while Europe is knocking at one door we are slowly beginning to recognize that this particular door may prove to be the back door of our domestic establishment, while what we have scarcely deemed a portal of access at all is rapidly assuming the dignity of a front entrance."

A future plane dispatcher's voice reverberates in the waiting room of a great American airdrome, "All aboard for Tokyo, Shanghai and Manila. Change at Shanghai for Saigon and Singapore."

As for what the coming of the airplane means to Asia it is best expressed by two lines of Douglas Mallock:

"For here in the East men dream the dreams of the things they hope to do,  
And here in the West, the crimson West, the dreams of the East come true."

## Williams Introduces New Duo-hex-Box "Superrench"

J. H. Williams & Co., Buffalo, N. Y., who manufacture the popular line of "Superrenches," have just introduced a new, 12-point opening, double head wrench called the Duo-hex-Box. This design is made in two patterns, Single and Double Offset, in five and nine sizes respectively.

The Single Offset pattern has the same size opening in both heads of the wrench, and will operate hex nuts when the tool can be swung through an arc of only 15°. The Double Offset pattern has a different opening at each end, and requires a swing of 30°,—less than 1/10 of a full turn. Both patterns are forged from Chrome-Molybdenum steel, the strongest, toughest wrench material made. As with all "Superrenches," these are heat-treated and chrome-plated over nickel. Finished bright. They are of extra length, with thin head walls, abrupt offset for greater clearance, and twelve-point openings.

J. H. Williams & Co. guarantees them against breakage.

Duo-hex-Box "Superrenches" have been produced expressly to meet the needs of mechanics and service men for use on connecting rods, main bearings, base, cylinder heads, and in other awkward places where clearance is limited.

Complete details and prices on these wrenches may be obtained on request from J. H. Williams & Co. or any of its jobbers.

## Construction Program of the Chekiang Electricity Bureau

THE extensive program of development of the Commission of Construction of the Chekiang Province necessitates an ample supply of electrical power, generated with a maximum efficiency, and provision for distribution throughout the low lying agricultural districts for drainage and irrigation, and to the important cities for industrial plants.

The Provincial Government passed a resolution to re-organize the Dah Yoh Lee Electricity Works of Hangchow and members of the Re-adjustment Committee were selected from the Stock Holders, Chamber of Commerce, Construction Commission and Electricity Bureau for the purpose of making a study of the financial status of the Plant under the former management and for recommending a method of financing the indebtedness to Stock Holders and other creditors. The recommendations of this Committee were approved by the Stock Holders and the Provincial Government and the control was vested in the Chekiang Electricity Bureau.

The revenues for the first year's operation under this plan have been more than ample for meeting financial obligations in conformity with the plan adopted by the Committee.

The Chekiang Provincial Government has authorized and issued Construction Bonds, to the amount of Dollars Ten Million (\$10,000,000.00) which are to be retired in eighteen installments at six month intervals during a period of nine years. These bonds were discounted 2 per cent. and the rate of interest is 8 per cent. payable semi-annually. The bonds are secured by the revenue from a surtax on land, from which Dollars One Million and Six Hundred Thousand (\$1,600,000.00) per annum is appropriated for refunding the principal and interest.

The amount received from the sale of bonds is to be entirely devoted to the building of a railway between Hangchow and Kiangsu, a highway between Hangchow, and Huchow and Dollars One Million and Nine Hundred and Eighty Thousand (\$1,980,000.00) has been allotted to the Provincial Electricity Bureau.

A program of electrical development, covering a period of five years, is now being formulated, involving the Construction of a fifteen-thousand kilowatt initial unit for a generating station at Hangchow, the re-construction of the electrical distribution system in the City of Hangchow, and the construction of transmission lines to Yuhang, Kashing and Huchow. The construction of irrigation and drainage plants and the addition of the second unit, to the Hangchow Plant, of 15,000 kilowatts capacity and an electric railway system for the City of Hangchow are expected to be started during this period. The construction and equipment of an electric testing laboratory is also contemplated.

The nett operating revenue of the Hangchow Plant, after providing for interest on indebtedness and reserve for depreciation, is now 20 per cent. of the amount of the outstanding capital stock.

There are eighty-thousand houses representing potential consumers in the City of Hangchow and electric service is now being provided to sixteen-thousand. Additional consumers are being connected at the rate of six hundred per month. Provision is now being made for financing the cost of wiring with installment payments, which is expected to increase the rate of connections from 600 to 800 per month.

Rates to power consumers have been revised and the supply of power to industrial plants within the area of the distribution system is increasing at the rate of 100 kilowatts connected load per month, and provision is being made for connecting additional large mill and factory loads of more than 2,000 kilowatts.

The extensive areas of agricultural land, which are now flooded during the summer months and which may be economically drained with motor driven pumps, will provide ample load to fully utilize the capacity of the Plant equipment and the Electricity Bureau is now planning for the construction and operation of pumping plants.

Surplus plant capacity will be available during the winter months for electric heating and the rate of growth of this class of load during the past winter has shown that the extent to which this class of load can be developed largely depends upon the rates which can be maintained for this service.

A high ratio between the amount representing the average load and that representing the maximum load for this plant will

permit of a correspondingly high operating efficiency. If the expectations of the Electricity Bureau are realized in maintaining a load factor in excess of 60 per cent. the efficiency of the plant now under construction will compare favorably with the best plants now in operation; and, even with exceptionally low rates for service, annual profits of 20 per cent. on the invested capital, may be expected.

The inter-connection of isolated plants now under private management with the Government controlled system will provide power for lighting which may be marketed by the existing companies and extend the area where power service is available at low rates for drainage, irrigation and industrial developments.

During the past year the operating expenses of the Hangchow Plant have been reduced from Dollars Fifty-Six Thousand (\$56,000.00) to Dollars Forty-Five Thousand (\$45,000.00) per month while the gross receipts have been increased from Dollars Eighty Thousand (\$80,000.00) to Dollars One Hundred and Twenty Thousand (\$120,000.00) per month.

The operating expense is now being maintained at 40 per cent. of the amount of the gross receipts.

The provision of funds from the issue of Provincial Government Construction Bonds and the surplus earnings from the operation of the Plant have been utilized to obtain bank credits for financing the program of development for a period of three years.

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### The Lien Ping Kiang Irrigation Scheme

(Continued from page 298).

of the Sung Dynasty. However nothing was ever done to carry out the project, until after the establishment of the Republic in 1911. The suggestion was then brought up, but actual work was not started till March, 1927. The actual construction was started in May, 1928, and finished in February, 1929.

The length of the completed irrigation area is sixteen Chinese *li*, which irrigates a total of 60,000 *mou*, and will be extended to another 40,000 *mou*. In this area it requires a total of rainfall of one foot in the months of July and August for the raising the crops. The scheme as completed has a capacity of pumping 130 cub. feet per second in a twenty-hour day, with a lift of 38 feet.

Two pumping stations are installed in two different places 7,600 feet distant from each other. The canal connecting these two stations has a width of ten feet with seven foot protecting banks on each side. The rate of flow is 260 cub. feet per second. The second station is located 36 feet above sea level. This station is connected with a canal 1,300 feet long. The canal is cut through a hill of hard gravel. The main left canal has a length of 49,500 feet, with branch openings at every hundred feet. The canal here is 29 feet above the sea level. The right main canal has a length of 38,000 feet with other particulars the same as the left main canal. The total cost of this project is \$1,057,110.13.

The crop increase in the first year of operation has amounted to 233,000 piculs.

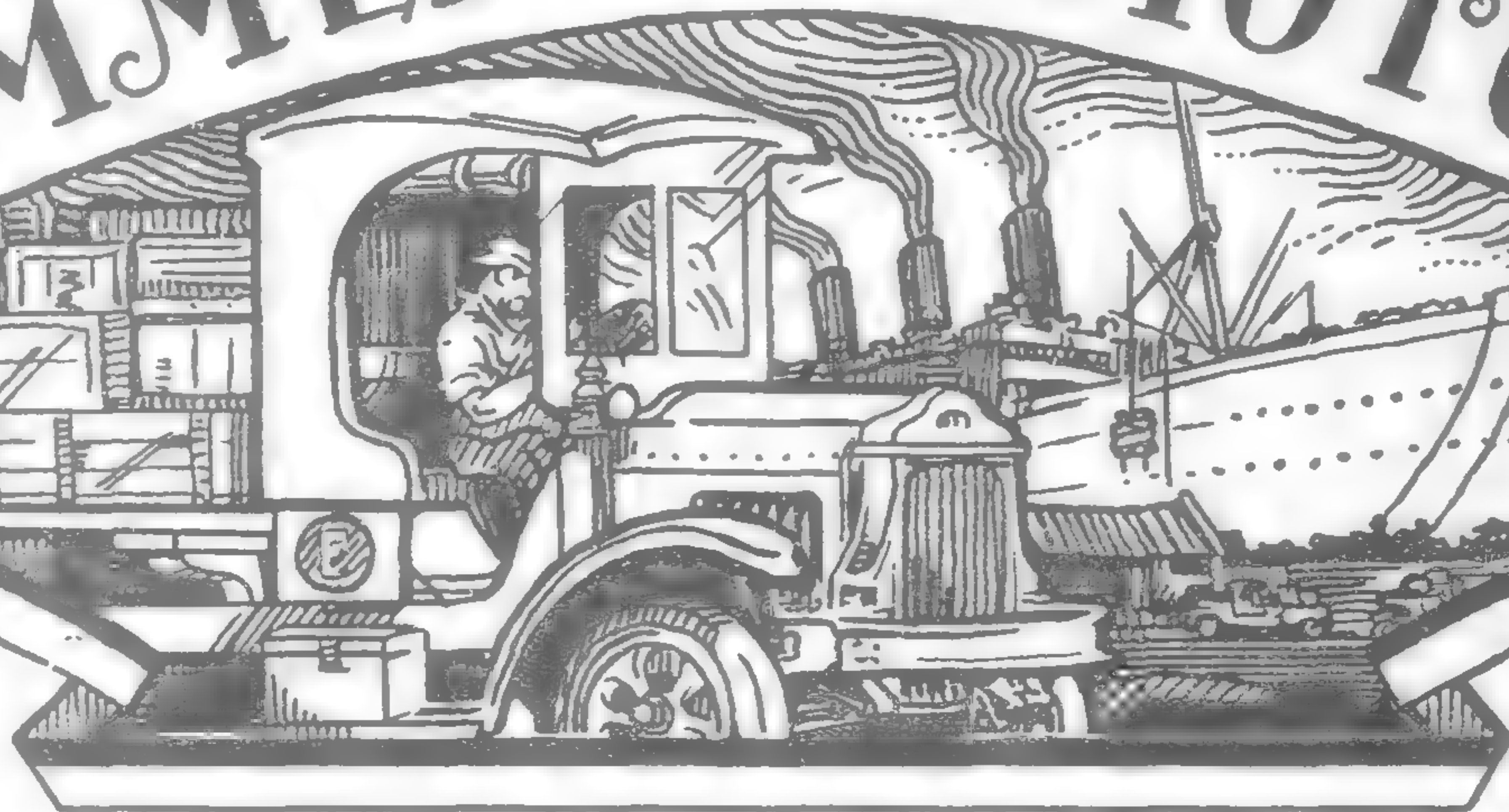
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### New Motor Vessels for the Shanghai-Ichang Run

In view of the fact that none of the Chinese shipping companies have any vessels on the Shanghai-Ichang service, whilst British and Japanese companies have seven and three each, respectively, arrangements have been made for the construction of four Chinese-owned motor vessels for this line.

A series of meetings were held in the offices of the China Merchants' S. N. Co. last week and the matter was discussed at length. After considerable discussion, it was agreed that Chinese shipping companies should be represented on this important service and a decision was reached to construct four new high-powered vessels, fitted with Diesel motors. The cost, it is understood, will be approximately Tls. 600,000 each.

# COMMERCIAL MOTORS



## General Motors in the Far East

JAPAN'S efforts to attract American capital for the development of her industries has led in the past few years to the establishment of several promising co-operative enterprises. The example set by the General and the Western Electric Companies in combining with Japanese interests in forming the Shibaura Engineering Works, the Tokyo and Nippon Electric Companies has been followed by the Westinghouse-Mitsubishi, Babcock & Wilcox-Mitsui, Sumitomo-Western Electric and other combinations of American and Japanese capital. The Corn Products and Nitrogen Products Companies, the Aluminum Company of America, Eastman Kodak Company and the Radio-Victrola combination are also erecting plants in Japan to meet the Far Eastern demands for their products. The establishment of the Ford Motor Company at Yokohama and the General Motors Corporation plant at Osaka is also indicative of the new trend of American economic expansion in the Far East. This willingness on the part of American manufacturers to develop subsidiary plants in Japan is due primarily to the guarantees of law, order, justice and security existing in that country combined with freedom from excessive taxation, radical labor legislation and the assurance of a fair return on the investment.

The demand for motor transportation in Eastern Asiatic countries, created by new highway construction has expanded so rapidly in the past five years that it is more economical for the larger automobile manufacturers to establish branch manufacturing and assembly plants in strategic distribution centers than to pay the high freight, boxing, lighterage, customs and other charges on machines exported in a complete state.

In searching for an appropriate distributing center for its China and Japan trade, the General Motors finally decided to erect its initial plant in Japan. A site was acquired in Osaka with an extensive river frontage near the harbor and within the limits of the "free zone" where imported materials are landed and manufactured into finished products without the payment of customs duties until they pass the customs barrier. Manufactured products exported direct from this zone are exempt from customs duties. Under this arrangement, the General Motors plant is in an exceptionally favorable position to benefit from the many advantages accruing from the supply of highly-trained Japanese mechanics and the purchase of many minor parts that can be bought more cheaply in Japan than in the United States.

Perhaps the deciding factor in influencing the General Motors to establish itself in Japan, is the rapidly increasing demand for motor transportation in that country. Some idea of the importance of this Japanese market may be gathered from a recent official survey which estimates the approximate registration of motor

vehicles up to 1935. In 1927, there were 40,000 cars and trucks in Japan; in 1928, 75,000 were licensed, while in 1929, the total approximated 100,000. At the present rate of increase, it is estimated that there will be 250,000 cars and trucks in Japan by 1935. All but a small percentage of the motor vehicles in Japan are of American origin. It is difficult from the custom's reports to determine the exact number of cars imported into the country, as the returns give only an approximate idea of the number of completed vehicles embraced in the item of parts. For instance, in 1928, there were 7,883 complete motor vehicles imported, valued at Yen 13,771,000 while in the same year the custom's returns show that parts of motor vehicles were imported to the value of Yen 18,474,000. In this figure is represented the value of the cars and trucks assembled and manufactured at Ford and General Motors plants in addition to four or five Japanese firms who are endeavoring to build up a domestic industry under a subsidy from the Government.

The General Motors Japan plant at Osaka is a complete manufacturing unit turning out eighteen different models of cars and trucks. The component parts are shipped from America in boxes containing sets and quantities under bills of lading specifying the nature and quality of the individual article. Every part enters Japan as raw or partly manufactured material, paying the lowest duty imposed by the customs tariff on such imports. As a matter of fact, only about thirty to thirty-five per cent. of the value of the finished car represents material imported from the United States, while from ten to twenty per cent. represents materials purchased in Japan. At present, all General Motors vehicles manufactured at the Osaka plant are equipped with tires, upholstery materials, glass, batteries and other minor materials of purely Japanese origin or manufacture. The policy of the corporation is to extend this practice wherever local materials of equal or superior quality can be purchased at equal or lower prices. In 1928, out of a total sales value aggregating Yen 45,000,000, ten per cent. represents cost of materials purchased in Japan. It is hoped that in due course, the General Motors products manufactured in Osaka will be essentially Japanese in every respect. So far has this idea taken hold, that several of the General Motors models sold in Japan are already spoken of as "Japanese cars."

The Osaka plant is the largest and most completely equipped automotive manufacturing plant in the Far East. It is now turning out seven different Chevrolet models, two Pontiac, two Oakland, two Oldsmobile, three Buick and two Marquettes. The Osaka plant is specially equipped to handle the popular Chevrolet models and in addition to the assembly department, there is a completely equipped commercial body building plant adjoining the main factory.

# GENERAL MOTORS JAPAN, LTD., PLANT AT OSAKA



Final Inspection General Motors Cars at Osaka



Testing Chevrolet Sedan: General Motors  $\frac{1}{4}$  Mile Concrete Test Track at Osaka



Planing Wood by Modern Machinery General Motors Commercial Body Plant



Latest Brake Testing Machinery Chevrolet Truck Chassis



General View of General Motors Manufacturing Plant at Osaka, Japan

Left: Body Building Plant. Right: General Assembly Plant Service School, Spare Parts Warehouse, Office and  $\frac{1}{2}$  Mile Test Track

Here are built the numerous types of bodies for the Chevrolet truck chassis to suit the many requirements of the Japanese and Chinese market.

The plant employs more than 1,200 people, of which, 96 per cent. are Japanese. In the manufacturing end, only two foreigners (both British) are employed in superintending the work. When the plant commenced operations in 1927, it was handicapped the first year by the lack of skilled workmen to such an extent that only a few cars per day could be turned out. Under efficient instructors, the Japanese workmen soon learned modern factory methods and mass production and the output steadily increased from day to day until in 1929, it reached a total of over 17,000 vehicles. The plant has a capacity for turning out about 35,000 vehicles a year, but the production last year was only 17,000, of which 14,242 were for the Japanese market while 2,648 were exported to China.

The experience of the General Motors with Japanese workmen and skilled mechanics has been highly satisfactory as far as their adaptability and efficiency is concerned. As far as possible, every position in the manufacturing and clerical departments is being filled by Japanese. The experience of the General Motors is similar to that which all large employers of labor in Japan have had to face in the past ten years. The future of Japan's place in the industrial world and her ability to compete in foreign markets with the manufacturers of other countries will depend largely upon a proper adjustment of a paternalistic labor and administrative system which prohibits the discharge, suspension or retirement of officials and workmen without salary payments ranging from two weeks to twelve months pay, according to the time the workman or official has been with the company. As long as Japanese industries are operated within a high protective tariff wall to meet the requirements of the home market, these excessive overhead expenses will be paid by the domestic consumer. But, if Japanese products are to find an outlet in the world's markets in competition with those of other manufacturers whose costs are lower, Japan will be compelled, sooner or later, to adjust her administrative and labor system to conform with those of her competitors. Until this is done, the experience of the General Motors in precipitating a general strike because of its decision to curtail production by laying off its workmen, will react unfavorably on future investments of foreign capital in Japanese industries. Although established primarily to supply the rapidly expanding requirements of the Japanese market, it was hoped that the branch American automobile plants in Japan would also manufacture cars for other Far Eastern markets, especially China. If these enterprises are to succeed in the severe competition for the Chinese trade, there must be some elasticity in the Japanese labor system which will permit capital to adjust itself to the wide and rapid fluctuations of the Chinese demand, by curtailing production when

conditions call for such retrenchment. Otherwise, there can be no inducement for foreign capital to establish subsidiary plants in Japan, except to supply the purely domestic trade. The peculiar labor and administrative system of Japan evolved from the old feudal relationship between overlord and dependant has undoubtedly contributed largely to the phenomenal progress and industrial expansion of the nation but it stands to-day as one of the chief obstacles to Japan's success in the export field.

The Japanese have been so successful in developing manufacturing industries under government encouragement and subsidies to meet the requirements of their own market, that they have been encouraged to free themselves from importations of foreign automobiles. The British Commercial Counsellor at Tokyo in his last report on "Economic Conditions in Japan" refers to this tendency in the following words;

"Japanese industry has not invested much in the manufacture of motor vehicles. One firm produces a light car—the "Otomo"—in small quantities. The Ishikawajima Motor Car Manufacturing Company specializes in motor buses, the output at present being about 300 cars per annum. Two other firms, viz; Tokyo Gas and Electrical Industrial Company and the D.A.T. Co., manufacture trucks, principally for the use of the Japanese army, but the output is small. Both buses and trucks manufactured in Japan benefit by a subsidy which maintains an industry incapable on its present basis of ever becoming economically independent."

The Japanese however, are confident that they can build up an automotive industry that will close the market to foreign makes. A recent Japanese survey of the possibilities of the field, after showing the volume of imports of cars and parts, goes on to say:

"But such an enormous importing of cars cannot be regarded as a slight matter when observed from the viewpoint of its relation to international loans, military requirements and home industry. For this reason, opinion amongst the intellectual circles in Japan is inclining towards putting the automotive industry on an absolutely independent basis. Already, big corporations like the Mitsui and Okura are making preparations to control this home-made car industry. On the other hand, the Government, not being satisfied with leaving the matter in the hands of the Army Department as one of its subsidiary plans, has determined to let the Department of Commerce and Industry handle this matter in a positive manner. This explains the intense interest that now pervades our industrial leaders over the prospect of home-made cars. Our travelling merchants to the South Seas, India and China have brought news concerning the auto markets in those regions. They are of the opinion that these markets, because of their geographical situation, have enough room to push our home-



General Motors China, Inc. Shanghai Office

Mr. C. F. Cress, General Manager



Service School for Chinese Students

made cars, which are not inferior in quality to the more costly cars from Europe and America. The prospects are therefore hopeful. As far as the home-made car is concerned, in the near future, the industry will develop in a splendid way and the golden age in this industry is expected to come true before long."

The Home Products Encouragement Commission which acts as an advisory board to the Ministry of Commerce and Industry, has recently adopted a resolution calling for a subsidy of ¥5,000,000 for distribution to the leading Japanese automobile manufacturers with the idea of increasing the home output to 5,000 cars per year for the next five years. This subsidy is to be supported by an additional tariff on imported automobile parts. A Bill is scheduled to be submitted to the next session of the Diet based on this decision. Even with the stimulus of high subsidies and increased customs duties, it will be difficult to create an independent automotive industry in Japan in competition with the massed production of American manufacturers, at least, until a modern highway system links together the cities, towns and villages of the empire and creates the larger demand for cars and trucks upon which such an industry must be based. The future of the automotive industry in Japan will depend very largely upon the attitude of the Railway Ministry towards new highway construction. As the railways are operated by the government and produces a handsome revenue for the national treasury, the ambitious highway program of 9,000 miles of new roads has been referred to the Railway authorities for investigation and approval. It will be many years before Japanese initiative and enterprise can hope to successfully operate a homemade automotive industry. As for exporting Japanese automobiles and trucks to China and the South Seas, where they will come into active com-

petition with American and European mass production and high-powered sales methods and publicity, the outlook is not very encouraging.

There is every reason to believe that the future usefulness and prosperity of the American automotive plants in Japan will not be seriously impaired by the establishment of a competitive Japanese industry and if, as time goes on, the labor problem continues to be an obstacle to the development of a successful export trade, a solution will be found by erecting further manufacturing plants in China.

The General Motors plant at Osaka, situated within the free zone, could easily be developed into the most important automotive manufacturing plant in Asia, if hearty co-operation is forthcoming from the Japanese. In its short three years of existence the plant has already exercised a marked effect upon Japanese factory methods and sales efficiency. The plant, for all practical purposes, is as much a school as an industrial enterprise, taking in raw workers and developing them into expert mechanics, highly trained in modern factory and mass production methods, creating a skilled labor group that can be drawn upon for employment in other Japanese industries; a decided asset to the nation. The plant also

maintains a service and accounting school with a model dealer's office and service station, where Japanese dealers and salesmen are taught the most up-to-date American methods of salesmanship and standard accounting. This course of instruction, from one point of view, is the most important feature of the undertaking. The dealer's school in Osaka is making better salesmen out of the Japanese; another valuable asset to the nation. A noteworthy feature of the plant is the warehouse of spare parts, where stock valued at a quarter of a million gold dollars is kept constantly on hand to meet the requirements



General Motors Showroom at Shanghai

of the sixty-one General Motors dealers in Japan and the emergency calls from China and other parts of the Far East.

An insight into the tremendous growth of the General Motors Japan, Limited, and its contribution to the economic welfare of Japan may be gained from the following figures concerning the business of the company given out by Mr. R. A. May, Managing Director of the General Motors Japan, Ltd, on the occasion of the plant's fourth anniversary.

"During this period, we have turned out all told 38,798 motor vehicles, of which 33,639 were Chevrolet cars and trucks, while 5,159 represent Buick, Pontiac, Oakland, Oldsmobile and Marquette cars and G. M. C. trucks.

"On the sales end, we have disposed of 35,453 vehicles on the Japanese market, amongst which were a few complete cars imported from America. We shipped 5,368 to China. This goes to show that we are the greatest motor car builder and distributors in the Far East and reflects our humble effort to make Osaka the hub of motor car industry in the Orient.

"As we have repeatedly declared ever since we opened out Osaka headquarters, we are conducting our business with a definite policy—with the ultimate object of making this a thoroughly Japanese concern. While we ourselves maintain a large plant it should not be lost sight of that we purchase an enormous quantity of materials on the Japanese market.

"During 1929 we bought domestic materials valued at Y.3,459,340. In regard to the Chevrolet cars and trucks built in Osaka, only 25 to 27 per cent. of materials used that enter the retail prices, are imported from America, while materials for hodies are almost entirely Japanese. From now on American materials for Chevrolet trucks will be further lessened. We are a great customer for the Japanese shipping concerns and the Imperial Government Railways, and have extensive dealings with Japanese banks, insurance companies and a great many commercial houses.

"The import duties and numerous taxes paid, reach a staggering figure. Last year we completed a plant for commercial bodies adjacent to our Tsurumachi plant, which is regarded by many as the largest and best-equipped of all in the Far East.

"We have on our payroll 1,276 persons, 87 per cent. of whom are Japanese. Another point, worthy of note is the fact 12 positions of trust and responsibility, hitherto assumed by foreigners are now admirably held by the Japanese, and I am pleased to say that the showing the Japanese have made, has immensely enhanced my confidence in them.

"We have sent three Japanese staff members abroad during the past two years. One of them studied the manufacturing of commercial bodies in Germany, while two others made a systematic study of voluminous production and sales promotion in America. Ninety-four staff members and 174 operatives who saw three years continuous service were awarded medals."

### General Motors in the Far East

The foreign sales policy of the General Motors Corporation is to organise its own subsidiaries in the various countries of the world and erect its own warehouses, assembly and manufacturing plants, to supply the requirements of their respective territories. Pursuant to this programme, there are several General Motors operators in the Far East, with regional headquarters at Singapore under the direction of a vice-president of the General Motors Export Corporation. This position is now held by Mr. H.B. Phillips who is well known in China and Japan. In addition to General Motors Japan Ltd., with offices and manufacturing plant at Osaka, there is the N. V. General Motors, Java, with headquarters at Batavia, and an assembly plant at Tanjonk Priok; General Motors India, Ltd, with headquarters at Bombay, General Motors in the Philippines, and General Motors China Inc.

### General Motors in China

The establishment of General Motors China Inc., a company organised under the Laws of Delaware, with a nominal capital of G.\$200,000 has come in recognition of the growing importance of the Chinese automotive market. There are at present already more than 10,000 cars and trucks of General Motors production in China, of which about 3,500 were imported during 1919 alone. This was an increase of over 50% as compared with 1928.

General Motors China Inc., operates a Central Branch at Shanghai, which covers the needs of Central China, and a Branch at

Mukden, which looks after the requirements of North China, Manchuria, and Mongolia.

Although General Motors does not market its products directly but deals with the public through a system of dealers, the duties of these branches are of a varied and extensive nature.

Both Branches maintain warehouses at which they carry constant stocks of cars and trucks so as to enable General Motors dealers to attend to the public demand without the customary delay when orders have to be filled from the United States.

A huge depot of spare parts valued at over \$3000,000 is maintained at Shanghai, from which the stocks of spare parts of General Motors dealers throughout the country are kept adequate at all times. This is a facility that is greatly appreciated by every car owner and truck and bus operator in China, where, owing to severe road conditions, replacement needs are particularly heavy.

The service departments of both branches assist General Motors dealers in the establishment of up-to-date service and maintenance facilities for owners of General Motors products. Moreover at Shanghai a General Motors Service School is being operated, at which free training is offered to mechanics of dealer establishments and those of bus and truck fleet owners. Three classes of students have already graduated and some of them are already carrying out the pioneering work of establishing motor transportation in outlying parts of the country.

A large amount of educational and technical literature has also been released in the Chinese language for the benefit of Chinese owners, and active assistance is being rendered to the Chinese Society of Automotive Engineers in the compilation of a standard glossary of Chinese automotive terms.

The Central Branch at Shanghai, under the management of Mr. C. F. Cress, occupies the former Nippon Yusen Kaisha building at 3. North Yangtze Road, which has been converted into the main office, a model showroom and Service School.

The organization of the China subsidiary does not foreshadow any immediate expansion of the Company's manufacturing operations in this part of the world, but must be viewed as a preliminary step that will place it in a position to expand rapidly by establishing an assembly plant at Shanghai, when the time for such a move is deemed essential. But already now the advantages offered by the presence of a General Motors organization in the country are being realised by users of motor vehicles in China, as can be judged from the recent large orders for General Motors products placed by various governmental, municipal, and other public bodies. The General Motors, with its vast capital and resources can therefore be considered as being in a most favorable position to play a prominent role in the development of motor transportation in China, and to take advantage of the first signs of stability.

It is interesting to note that the General Motors overseas investment in plant, equipment, inventories, and working capital is placed at Gold \$65,000,000. The wholesale value of the General Motors Export sales is over Gold \$250,000,000 or over 17% of the total business of the corporation. At any given moment there are over Gold \$50,000,000 of General Motors cargo on the high seas, requiring a special department to keep track of shipments and routing.

G. B. R.

### New Steamer for Amsterdam-Batavia Trade

The new steamer *Van Swoll*, built for the Koninklijke Paketvaart Maatschappij, of Amsterdam and Batavia, by the Rotterdam Drydock Company successfully underwent her trials on March 20. The vessel is constructed to the highest class of the Bureau Veritas.

The *Van Swoll* is 299 feet 10½ inches in length, b.p., 45 feet 11 inches in breadth, and 17 feet in depth to the upper deck, on a mean draft of 12 feet 11½ inches. Her deadweight capacity is 1,350 tons.

Accommodation is provided in comfortable quarters for 37 first class and 22 second class passengers. A four-cylinder double-compound Lentz-poppet-valve steam engine of 1,700 i.h.p. gives her a mean speed of about 12 knots. Steam is supplied by two water tube boilers of the Babcock and Wilcox type, with a total heating surface of 5,000 square feet, and fitted with underfeed mechanical stokers.

# Development of Water Tube Boilers in Japan—II

## With Special Reference to the "Takuma" Boiler

Prof. M. KAMO, D. Eng., M.I. Mech. E., M.I.N.A., M.I.E.S., M.A.S.M.E., M.A.S.R.E. Tokyo Imperial University, Tokyo, Japan.

### "Takuma" Boiler

#### (A) GENERAL CONSTRUCTION AND CHARACTERISTICS.

Amongst many types of water tube boilers of Japanese invention, "Takuma" boiler, at present, outnumbers many others with its most promising future of development.

Takuma boiler mainly consists of upper and lower drums connected with a number of straight water tubes, and has an extremely simple construction as is shown in Fig. 8.

Upper drum, supported by steel pillars and beams, is firmly fixed at one end or at the middle, according to its size, and is free to

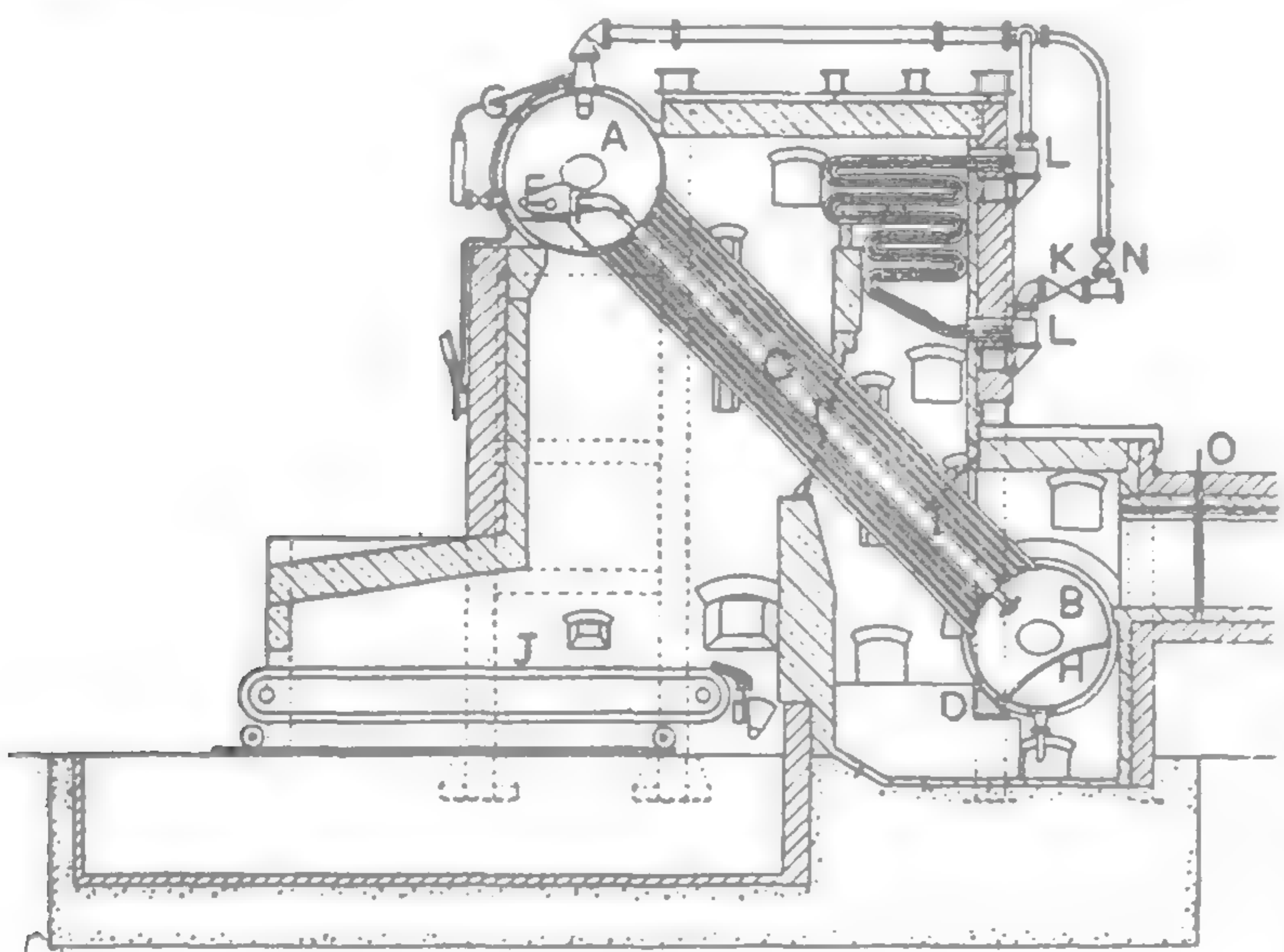


Fig. 8.—Standard Takuma Boiler

expand lengthwise, resting on roller bearings at its ends. Lower drum rests on an inclined sliding block arranged parallel to water tubes, thus providing the boiler a necessary flexibility for the variation of temperatures.

Water tubes are of 2½-in. external diameter and are fitted to both drums in zig zag fashion at an inclination of 45°. At the central part of the tube nest, is located a single row of double tubes of 5½-in. external diameter. The inner tubes of 3½-in. diameter are connected, at the upper end, to a feed water receptacle of half oval section fitted inside of the upper drum, while their lower end opens in the mud drum against mud separator. These inner tubes serve as downtake of feed water. In the feed receptacle, there is a feed internal pipe, which is perforated on the side facing to downtake tubes so as to induce the feed water to flow down quickly through these tubes. On reaching the lower drum, water suddenly loses its speed and deposits in sedimental form the impurities either suspended or dissolved in it. A blow off valve located at the bottom of lower drum serves to discharge the sediment effectively.

The passage of flame is divided into three to four section by means of baffle plates (I), made of specially prepared fire-resisting material. The largest being the first section, it provides a spacious combustion chamber to ensure the complete combustion of fuel. In the high temperature zone extending between first and second section, is located the superheater, which mainly consists of upper and lower headers (L) of square section connected with curved superheater tubes (M) as usual.

The roof of the brick work surrounding the boiler is of arched type for small sized boilers, but in larger sizes a patented suspension type is adopted. In the latter type air cooled beams of special fire-resisting cast iron hold special shaped bricks, which are tightened

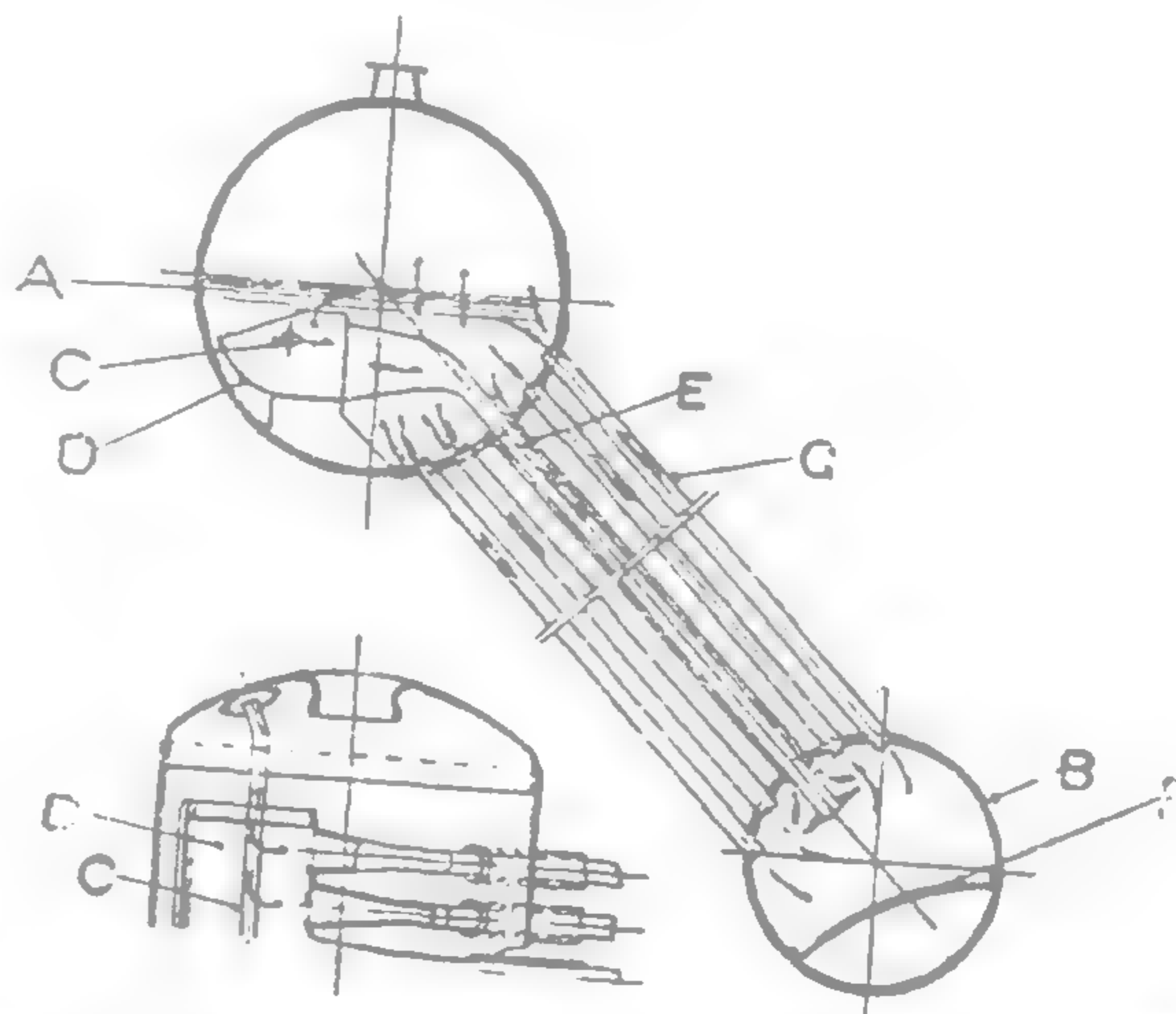


Fig. 9.—Diagram of Water Circular in Takuma Boiler

by inserting wedge-shaped bricks in between them. The construction is extremely simple and is not only free from undue strains caused by heat, but facilitates its partial repair.

The circulation of water and its evaporation takes place as follows :—(See next page Fig. 9).

The feed water discharged from feed internal pipe (C) fitted inside of the feed receptacle (D) dashes into downtake tubes and flows down through them rapidly to the lower drum. And after depositing impurities contained, it goes up through the entire steam generating tubes, encountering the gas of higher temperature, the higher it flows up, thereby decreasing its specific gravity. At the upper end of tubes vivid evaporation takes place absorbing heat from the gas at highest temperature in combustion chamber. Thus augmenting the difference of weight of water in steam generating tubes and downtakes, the circulation is further accelerated. The water separated from steam in the upper drum is collected in feed receptacle and again flows down through downtake tubes, mingled with fresh feed water, and repeats the similar circulation as before quickly and regularly. The passages of water up and down the tubes are distinctly separated without the aid of guide plates or any constraints whatsoever. When the evaporation increases, such perfectly natural circulation takes place more and more rapidly, without any fear of causing counter flow or creating eddies. The circulation actually occurring in the boiler is so speedy that after continuous working of the boiler for over six months, practically no scale was found inside the tubes, while a good deal of sediment was deposited in the lower drum.

On account of a large space left between fire grate and water tubes, complete combustion of fuel is made possible before the flame reaches the surface of water tubes, and the gas at highest temperature first strikes the upper part of tubes, where water, being almost ready to evaporate, is in its maximum need of heat. In consequence, the evaporation in this boiler mainly takes place at the uppermost end of tubes. The straightness of tubes and their direct attachment to the upper drum, combined with the rapidity of circulation, carries the steam bubble up to the steam drum as soon as it is generated, thereby leaving the inner surface of tubes

always in contact with boiler water of high heat absorbing capacity. Furthermore having water tubes arranged in zig zag fashion, the hot gas always strikes the tubes at right angle and sweeps off the dead film often enwrapping the tubes, thereby ensuring an efficient conduction of heat.

We may, now, summarize the characteristics of "Takuma" boiler as follows :—

- (a) Specially designed feed water receptacle and downtake tubes, by combined action of which rapid and regular circulation of boiler water can be maintained without any fear of causing priming ;
- (b) Quick evaporation and high rate of evaporation per unit area of heating surface ;
- (c) Design, construction and setting make the boiler entirely free to expand and contract in every direction and no undue strain is caused by heating or cooling ;
- (d) No special tube plate and header, simple construction and easy maintenance ;
- (e) Capability of being constructed to equip any grate adaptable for Japanese coal, thereby ensuring perfect combustion, higher efficiency can be attained ; moreover the efficiency curve is kept flat without much dropping at over-rating.

### (B) Transition and Development

■ Takuma boiler, for its originality, owes to the inventive genius of Mr. Tsunekichi Takuma. He began the study and experiments in 1908, and completed his first boiler in 1912, whose

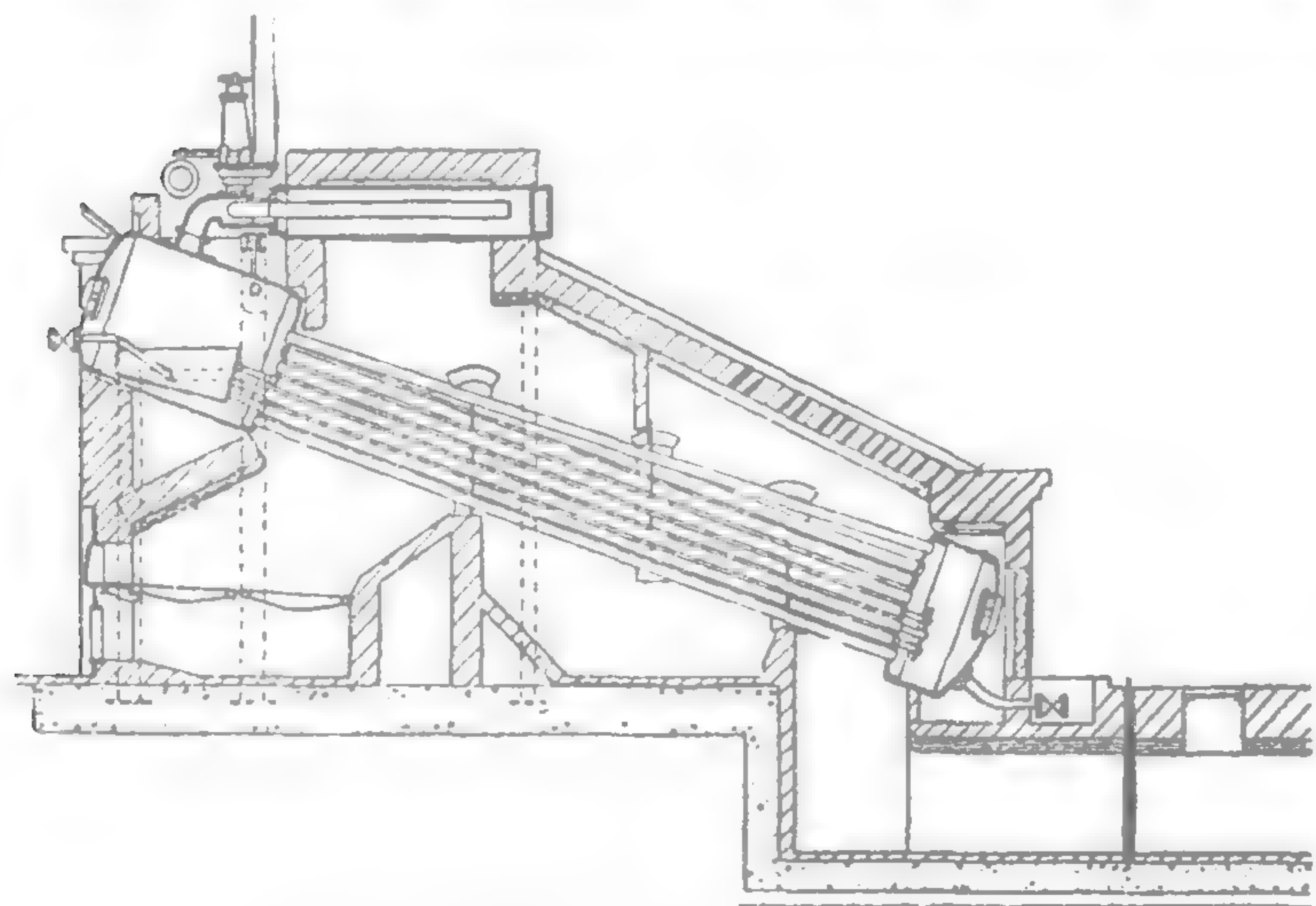


Fig. 10.—Takuma Boiler 1912 Type

patent right of various countries he obtained in the same year. Since then several improvements were made on the original type and has developed to the present perfection.

In his original boiler, the drums were arranged in longitudinal fashion and the tubes were expanded on end plates, as is shown in Fig. 10. In finding several obstructions, however, for increasing the capacity of boiler, drums were arranged transversally in its 1914 type Fig. 11. In this type, the tube plates were partially flattened in order to facilitate the fastening of tubes. The combustion chamber was enlarged by increasing the inclination of tubes. The downtake tubes were made in several sections jointed together, so that their withdrawal for inspection and cleaning was made easy.

But in order to meet the requirement for high pressure steam recently used, it was found necessary to make the drum to have a circular section. At the same time the following improvements were made :—

- (a) Inclination of tubes was increased to 45° and thereby the combustion chamber was further enlarged ;
- (b) Double tubes containing downtake tubes were made 5½ inch in diameter against 2½ inch diameter of the other steam generating tubes and only a single row of them was fitted at the middle of tube nest. For the inner tubes serving as downtake 3½ inch diameter seamless tubes were adopted.

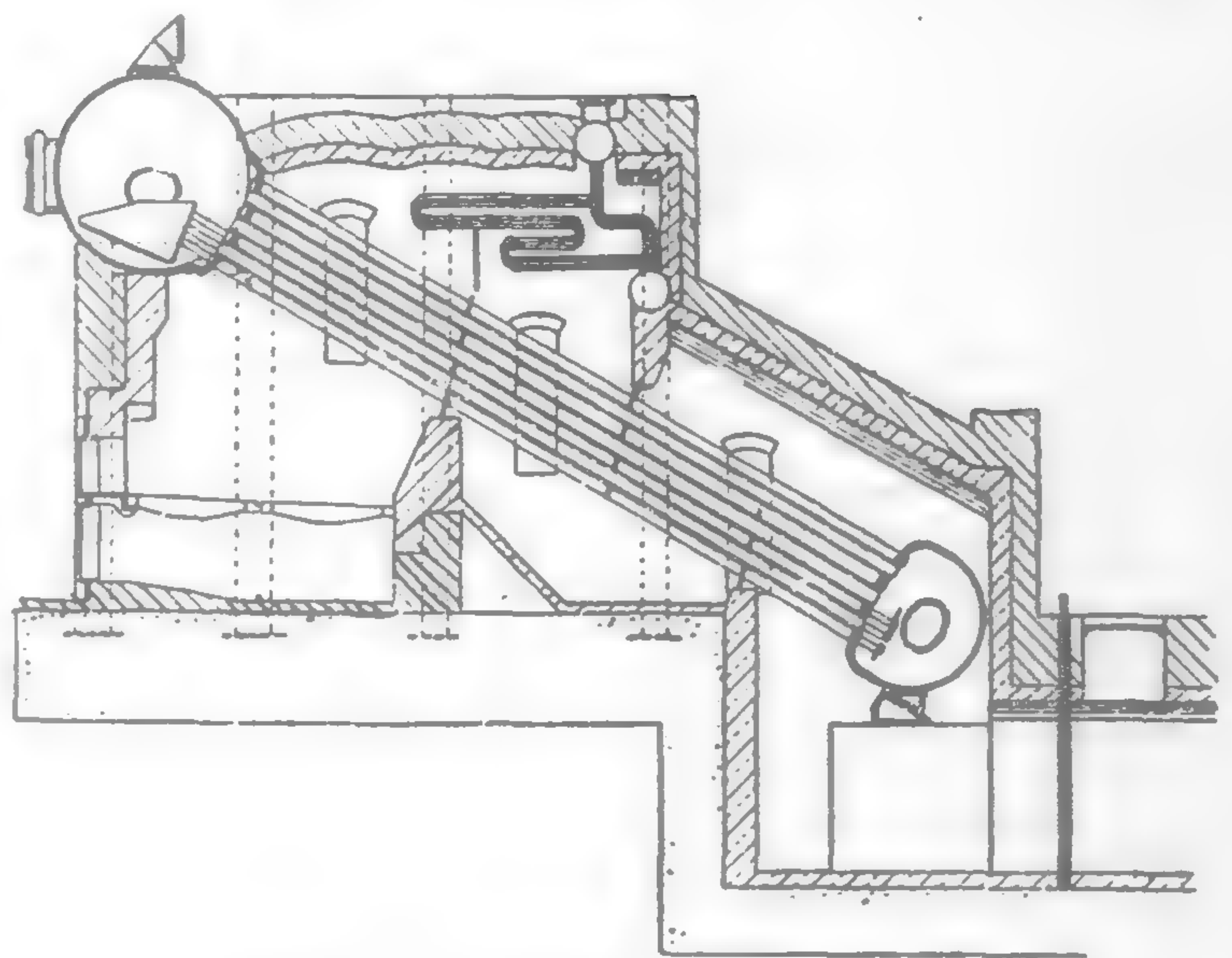


Fig. 11.—Takuma Boiler of 1914 Type

These changes resulted in making the construction, repair and cleaning simpler, without interfering with the circulation or losing the characteristics of the original design. Thus the latest "Takuma" boiler manufactured by Kisha Seizo Kaisha (Locomotive Manufacturing Company) since 1920, is as shown in Fig. 8, being constructed as mentioned above.

TABLE XI.

Test Results on Patent Takuma Water-Tube Boiler at Shingishu Power Station, Shingishu Electric Co.

Boiler heating surface	...	...	...	1,540 sq. ft.
Boiler heating surface	...	...	...	875 "
Economizer surface	...	...	...	1,858 "
Grate surface (Traveling grate stoker)	...	...	...	63 "
Volume of combustion chamber	...	...	...	435 cu. ft.
Draft, Forced Draft by a small fan contained in a stoker.				
Date of Test		May 21, 1928	May 22, 1928	May 23, 1928
COAL :				
Coal as fired per hr. lb.	...	958	1,400	2,337
Coal as fired per sq. ft., grate per hr. lb.	...	15.2	22.2	37.1
Heating value per lb. (as fired), B.T.U.	...	10,235	10,237	10,236
STEAM AND WATER :				
Steam evaporated per hr. lb.	...	6,810	9,751	15,098
Steam pressure by gage lb. per sq. in.	...	238	230	219
Superheated steam temperature, deg. fahr.	...	662	711	761
Superheat deg. fahr.	...	260	312	366
Temperature of feed water entering economiser, deg. fahr.	...	120	104	107
Temperature of feed water boiler, deg. fahr.	...	177	190	219
Equivalent evaporation per hr. (Boiler) lb.	...	7,409	10,482	15,762
Equivalent evaporation per hr. (Boiler, and superheater) lb.	...	8,417	12,159	18,782
Equivalent evaporation per hr. (Boiler, superheater and economiser) lb.	...	8,812	13,027	20,518
Equivalent evaporation per sq. ft. of boiler heating furnace, lb.	...	4.81	6.80	10.24
Equivalent evaporation per lb. coal (as fired) lb.	...	9.20	9.31	8.78
COMBUSTION PRODUCTS :				
Temperature of gases leaving boiler, deg. fahr.	...	422	500	601
Temperature of gases leaving economiser, deg. fahr.	...	302	286	355
CO <sub>2</sub> content, is gas leaving boiler, per cent.	...	14.1	14.1	14.36
HEATING EFFICIENCY :				
Combined efficiency of furnace, grate, boiler and superheater, per cent.	...	83.3	82.4	76.2
Combined efficiency including economiser, per cent.	...	87.2	88.3	83.3

As will be clear from the foregoing Table XI, the boiler alone, without tube walls or any other equipment, can attain, under natural draught, an equivalent evaporation of 8 to 10 pounds

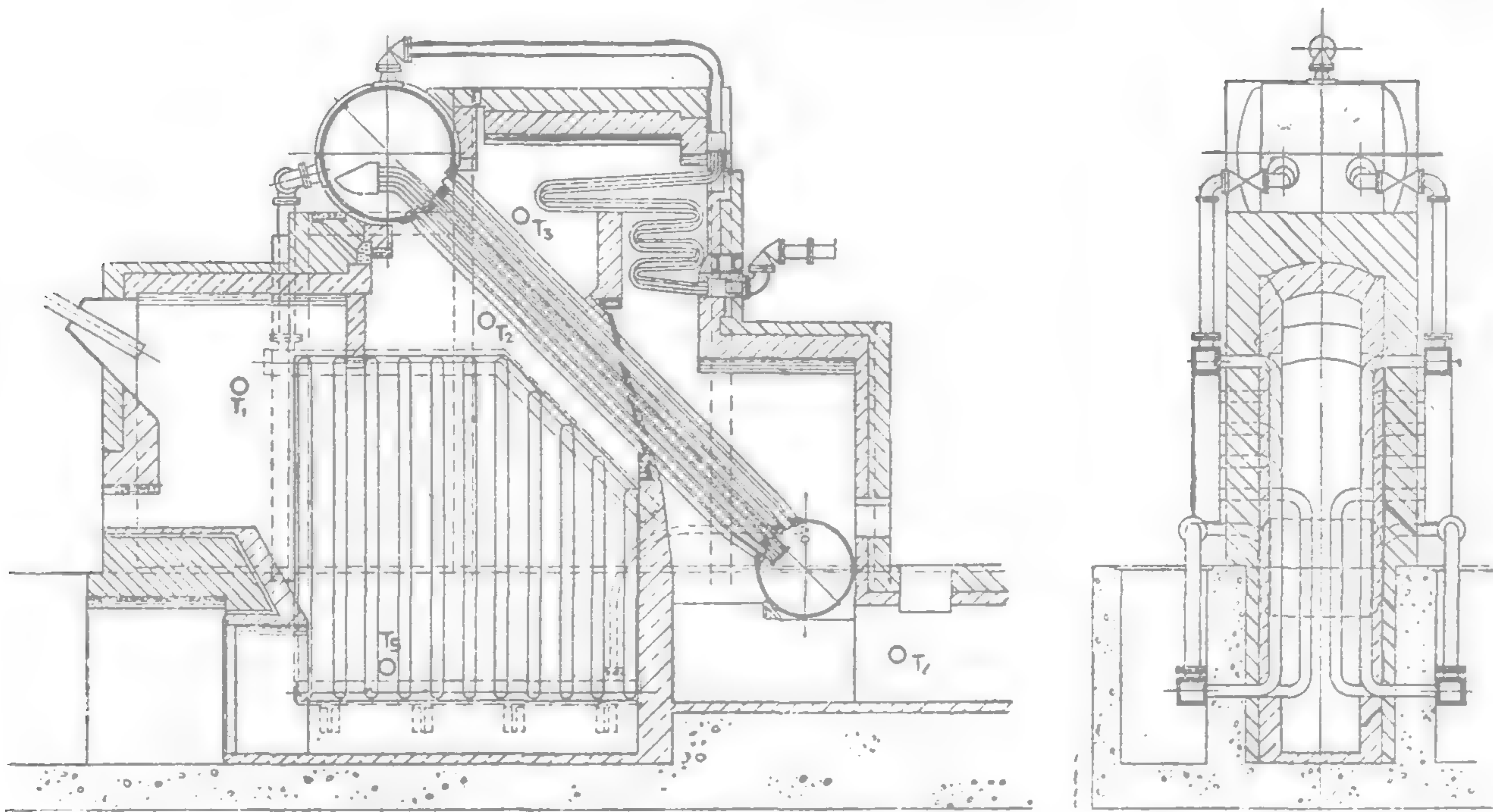


Fig. 12.—Takuma Boiler Fitted with Tube Wall

per sq. ft. of heating surface per hour. These figures correspond to 230 to 300 per cent. over-rating of ordinary boilers. Lately it was announced by the maker that under induced draught an evaporation of 15 pounds could be obtained per sq. ft. of heating surface per hour. Even at such high rate of evaporation, the boiler alone is showing amply an efficiency of 80 per cent., which falls only very slightly at a still higher rating. Such is thought really an excellent performance, which compares very favorably with that of any other boilers now in use throughout the world.

(D) Fields of Adoption

Such high rate and rapidity of evaporation, which characterize this boiler, make the necessary weight of the boiler for a definite amount of evaporation remarkably small. This fact combined with the lightness of its parts facilitates the transportation in no small measure. In consequence, this boiler lately cultivated its use in every direction. The following list shows the employment of this boiler to the date in percentage of its aggregate Horse Power :—

Employed for	Aggregate Boiler H.P.
Electric Power Station ... ..	15%
Machinery driving ... ..	30%
Manufacturing Industry ... ..	42%
Heating Purpose ... ..	13%

The adaptability of this boiler for providing large combustion chamber of suitable shape for any kind of low grade fuel has recently prompted the trial use of "Bagasse" for this boiler. An excellent result obtained, stipulated the adoption of this boiler, provided with the special grate for Bagasse burning, in several sugar companies in Formosa.

Furthermore the rapidity of circulation of water and consequent high heat absorbing capacity as well as the way in which the combustion gas impinges the water tubes make this boiler capable to reduce the temperature difference of flue gas and boiler water to an extremely small limit. This advantageous feature opened up a new field of application of this boiler for the utilization of waste heat available in several engineering works. It can, therefore, unfailingly be admitted that the boiler having secured, by the excellent performance in the past, firm standing in our market, is now beginning to exercise its formidable and competitive influence on foreign made boilers, cutting down the prices of the latter.

(E) Future Development

Takuma boiler of standard type, as shown in Fig. 8, was being tested for pulverized firing for several years in the Fuel and Ore-Dressing Research Institute of Korean Government General. How-

ever with the expectation of obtaining more favorable results, tube wall was recently fitted on this boiler. The results of comparative tests made before and after the attachment of tube wall are shown in TABLE XII.

TABLE XII.—RESULTS OF COMPARATIVE TESTS.

	With ordinary brick wall	With tube wall
T1 (Combustion chamber) deg. C. .. ..	1534	1590
T2 (Before generating tubes) .. ..	1100	732
T3 (After the 1st pass) .. ..	436	389
T4 (Flue) .. ..	271	179
T5 (Ash pit) .. ..	1148	415
CO2 Content % .. ..	14.6	14.5
Steam Pressure, gauge lbs. per sq. in. ..	148.7	145.5

This tube wall was provided in the boiler, which was not originally designed for that, and could not be expected to perform its  
(Continued on page 317).

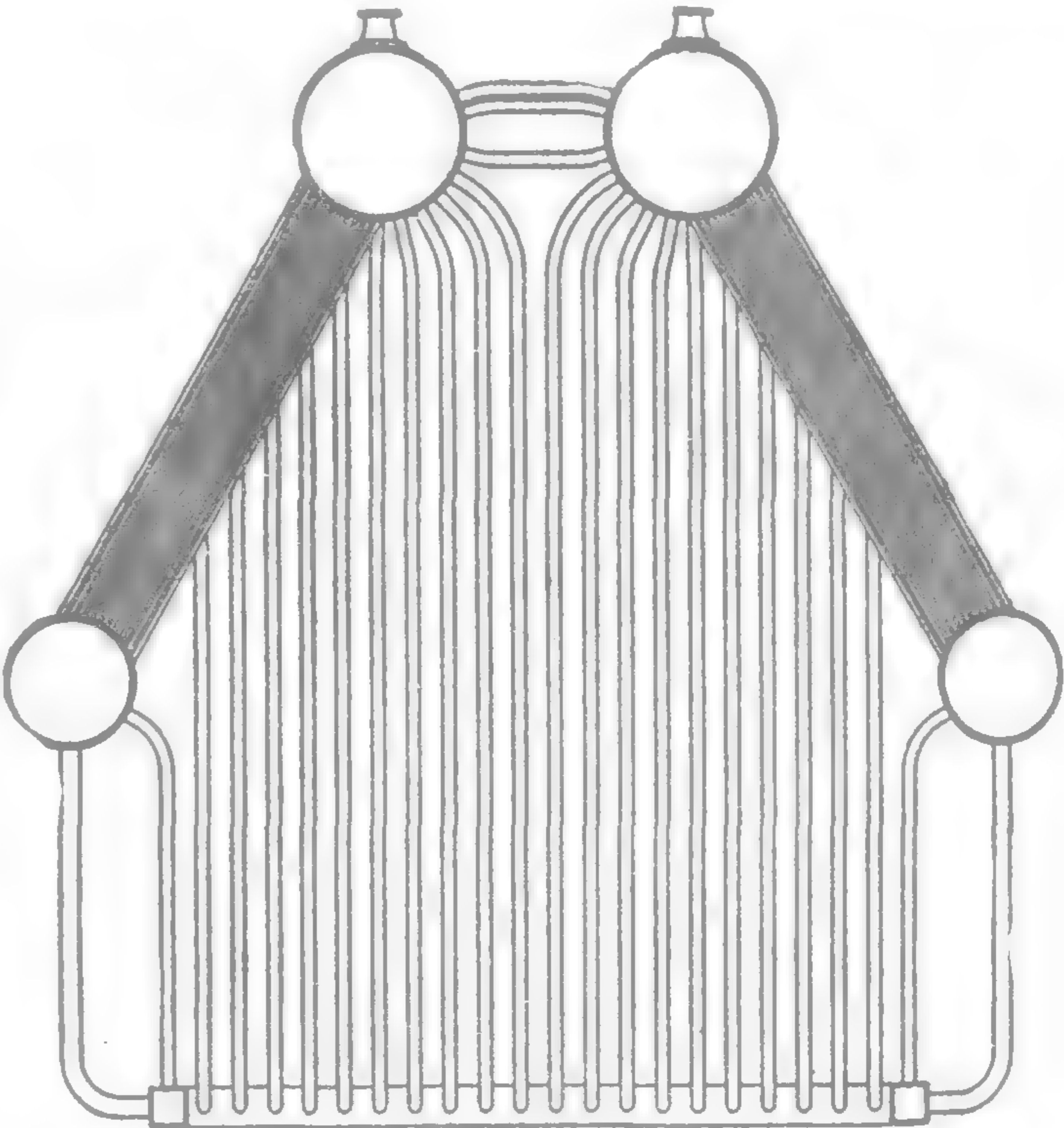


Fig. 13.—Takuma Boiler, one Type for Large Capacity

# Water Turbine Development in Japan—III

By MASATAKA TAZAWA, Director, Dengyosha Prime Mover Works, Ltd., Tokyo

## XVIII—PRICES OF IMPORTED TURBINES, AND BUSINESS CAPACITY BY COUNTRIES COMPARED.

To our knowledge, of all the imported and home manufactured turbines figuring in the international competition, American units were the highest priced, while Swiss turbines, of all European machinery, were the cheapest. Taking the Swiss price as 1.00, the American price stood on the average at 1.17 to 1.30, and German and Swedish prices were at par around 1.05. British made turbines have never cut any figure in the Japanese market. They participated in the competition to some extent, but never amounted to anything in point of securing business. The fact that this country is essentially not a hydro-electrically developed one, seems to have furnished the ground for discriminatory treatment by hydro buyers.

Under these circumstances it is no wonder that the greatest bulk of large size turbine orders booked by foreign manufacturers, during the early post-war years, went to Switzerland, followed by America, Germany and Sweden, in the order of importance, though the last named two countries broke about even. The fact that America captured second place, despite its high priced machinery, is also partly ascribed to the policy of many of the Japanese hydro-electric power corporations of enhancing their prestige in the eyes of the American banking groups handling their loans. This is evidenced by the fact that not even one concern, in the electric utility community, which is not concerned with any American loans, ever attempted to purchase American made turbines. It is rather the rule than the exception that for all medium size turbines below 10,000 horsepower, most hydro concerns are now dependent on home manufacturers, and only in very rare cases is a foreign make used.

In the nature of turbine manufacture, in which the machinery is designed and constructed on definite data, specially for each particular requirement, the prevalent practice of giving the award to the lowest bidder is open to question. If hydro-electric executives stop to consider the comparatively small amount of expenditure for their turbine, compared with other outlay, they would realize that their present attitude may not prove compatible with their best interests. In Chart 2 a comparison is made between the three items of civil works, electricity and turbine, based on the building cost of all the hydro-electric companies in all parts of the country. It is surprising to note that the expenditure for turbines, ranging from 4% to 10%, constitutes the smallest item of the initial outlay of the electric utility concerns. Even if twice the present average sum is expended for turbines, that should not cut a serious figure in the whole outlay plan. The machinery which costs the company so modest a sum is the vital factor for controlling the revenue situation of the company. Hydro-electric executives should think twice before paring to the bone their expenditure for turbines, thereby causing machinery manufacturers to engage in cut-throat competition.

Chart 3 shows the ratio of turbine cost to the whole plant cost, adjusted to the head of the hydro plant. The curve is obtained by connecting the average value of such ratios. A study of this Chart shows that the curve slopes very much easier for the head above 100 feet, but it becomes sharp below 100 feet, to have a still sharper slope as the head becomes lower. The variation in the curve of from 2 to 3% is traceable to the quality of the hydro site

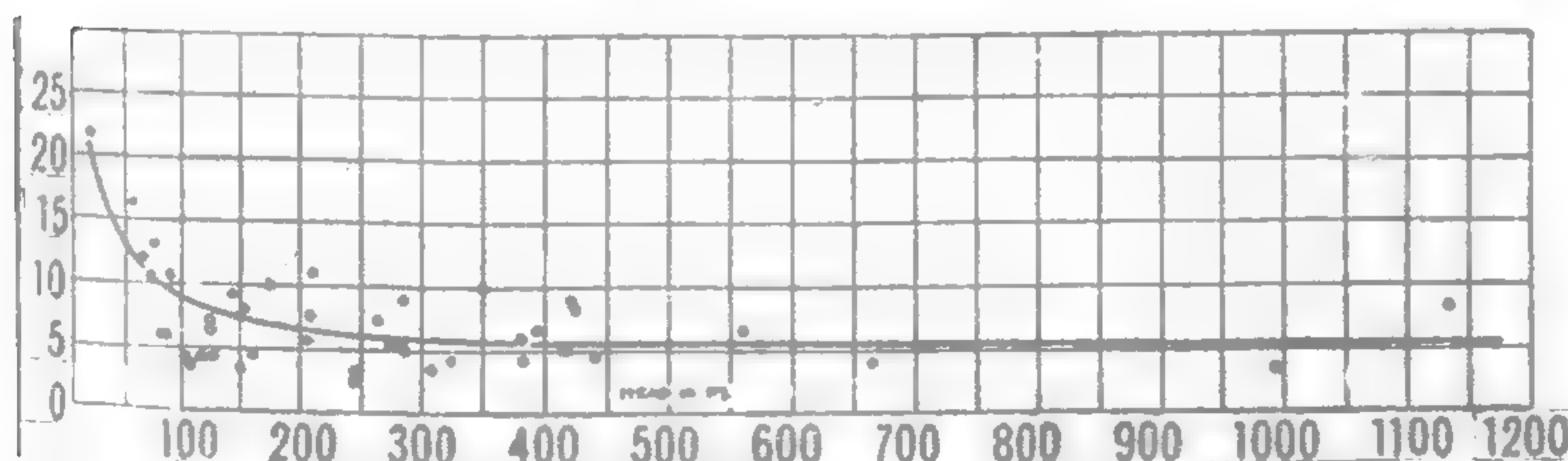


Chart 3.—Curve Showing the Relation of Head to the Ratio the Turbine Cost Bears to the whole Plant Cost

and the purchasing cost of turbines. The lapse of time should affect the curve, but this will be about offset by the price tendency in raw materials and labor cost, to reduce the former factor almost to negligible proportions.

The above Charts were compiled from authentic statistics collected from the hydro-electric companies of this country. These should form interesting bases of comparison for any similar tabulations, which we suggest the delegates participating in the Tokyo Sectional Meeting of the World Power Conference should prepare for the benefit of all interested in the subject.

## XIX—LABOR PROBLEMS INDUCED BY THE WORLD WAR AND THEIR EFFECT UPON JAPAN'S INDUSTRY

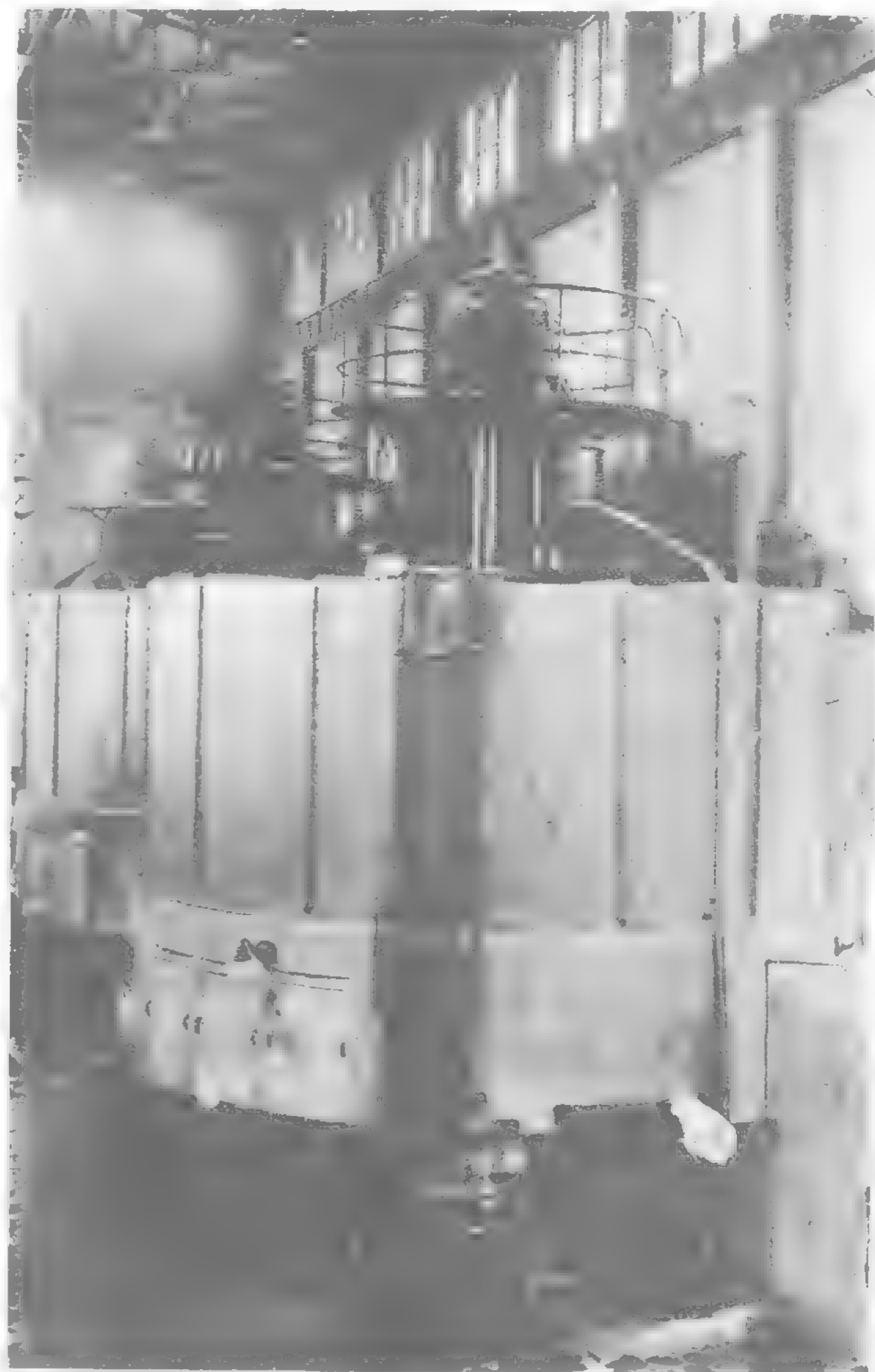
The European War was the occasion for the tremendous progress made in Japanese industry in the manner above described, but as mentioned in a previous chapter the war, at the same time, gave rise to labor unrest for the first time in its history, and from its trying effect no branches of industry were entirely immune, turbine manufacturing having its share. Up to the time of the World War the so-called collective bargaining by labor was not known in this country, where the employees' allegiance of feudal days had its momentum among the laboring class, which, supplemented by the paternalism of the employer class, never fired class consciousness. Under the old régime the employer and the employee worked for a common purpose, to promote mutual interests which always resulted in a fair headway being made in their joint enterprise. The employees were generally careless about money, but took pride in their work as an art, true to the fundamental national characteristics. This spirit, more than any other factor, was responsible for many industrial accomplishments of high order, in spite of the fact that the manufacturing plants were usually very meagrely equipped with modern machinery and tools.

At the time of the labor shortage during the World War, a handful of men, who were making a study of the labor movement in Europe, which had its origin in the remotest period, stirred up discontent in the minds of the laboring classes by propaganda, thus impairing the mutual good relationships which existed for centuries between them and the employers. Demand after demand was made by labor on the employers, and a series of walkouts backing up such demands completely demoralized working efficiency. Japanese industry, during this period was suffering a fearful shortage of raw materials, and the outbreak of the labor movement, unprecedented in history and with no means of redress kept things in a state of turmoil. The result was that labor had to be appeased by an increased wage scale and shorter working hours, instituting an eight-hour schedule and other changes; so that within a few years labor condition in this country were a counterpart of those of the countries of Europe, with their long history of bitter experiences. Labor revenue in Japan now trebled and even quadrupled that of the pre-war period, placing the income of Japanese high class operatives on a par with European intermediate workers.

On the other hand, labor legislation has helped to better the position of labor financially and otherwise, and the revenue, in these days of post-war profitless operations accruing to the employees, has suffered no decline. The proprietors, on the contrary, see their earning capacity steadily deteriorating because of post-war business readjustments, larger expenditure for maintenance, due to higher labor cost, and keener competition with fellow manufacturers. In striking contrast to the war time dividends of from 20 per cent. to 30 per cent. even the best money maker is now distributing only 7 per cent, and some are so badly off as to be unable to pay at all. Under the strain, the majority of the concerns, which owed their mushroom growth to the World War, have disappeared from the industrial map, and only those with the soundest of foundations are able to survive the weeding out process. The existing manufacturing plants are now on a par with any first class institutions of the kind in Europe and America with respect to their financial standing, operating methods and the quality of service.

## AN ALL AMERICAN WATER POWER INSTALLATION IN JAPAN

The Saku Power Plant of the Kanto Hydro-electric Power Company, Equipped with Three Allis-Chalmers 36,000 H. P. Water Turbines Operating Three 28,000 K.V.A. Westinghouse Generators.



### INTERIOR VIEW OF THE GENERATING STATION

Three (3) 28,000 K.V.A. Westinghouse Generator direct connected to Three (3) Allis-Chalmers 36,000 H.P. Water Turbines

#### LEFT COLUMN, TOP: RESERVIOR FOREBAY AT MAKABE

Area	.. ..	45,000 tsubo
Capacity	.. ..	30,000,000 c. f. s.
Maximum Height of		
Dam	.. ..	86 shaku
Width of the Bottom		70 "

#### DIFFERENTIAL SURGE TANK

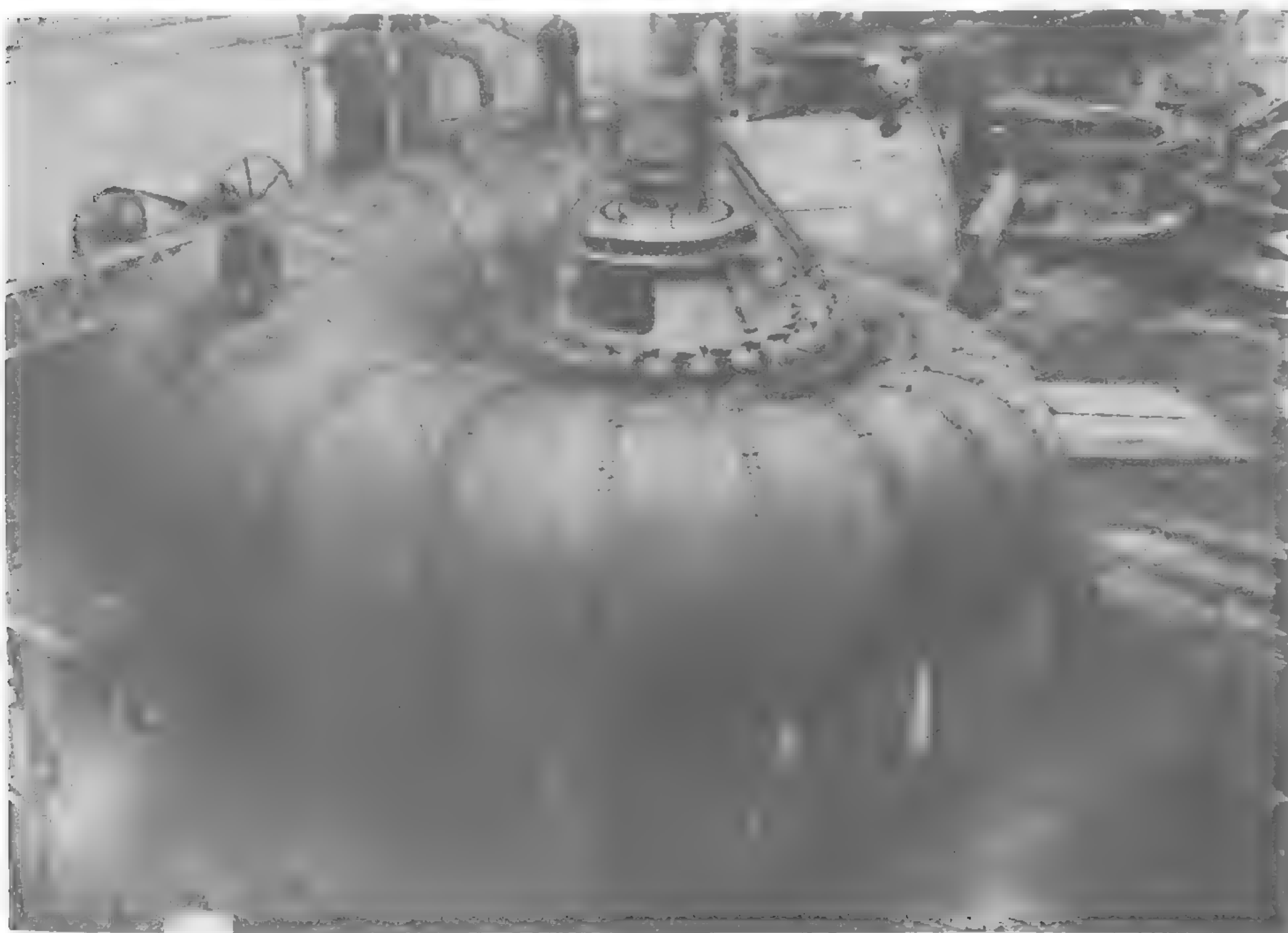
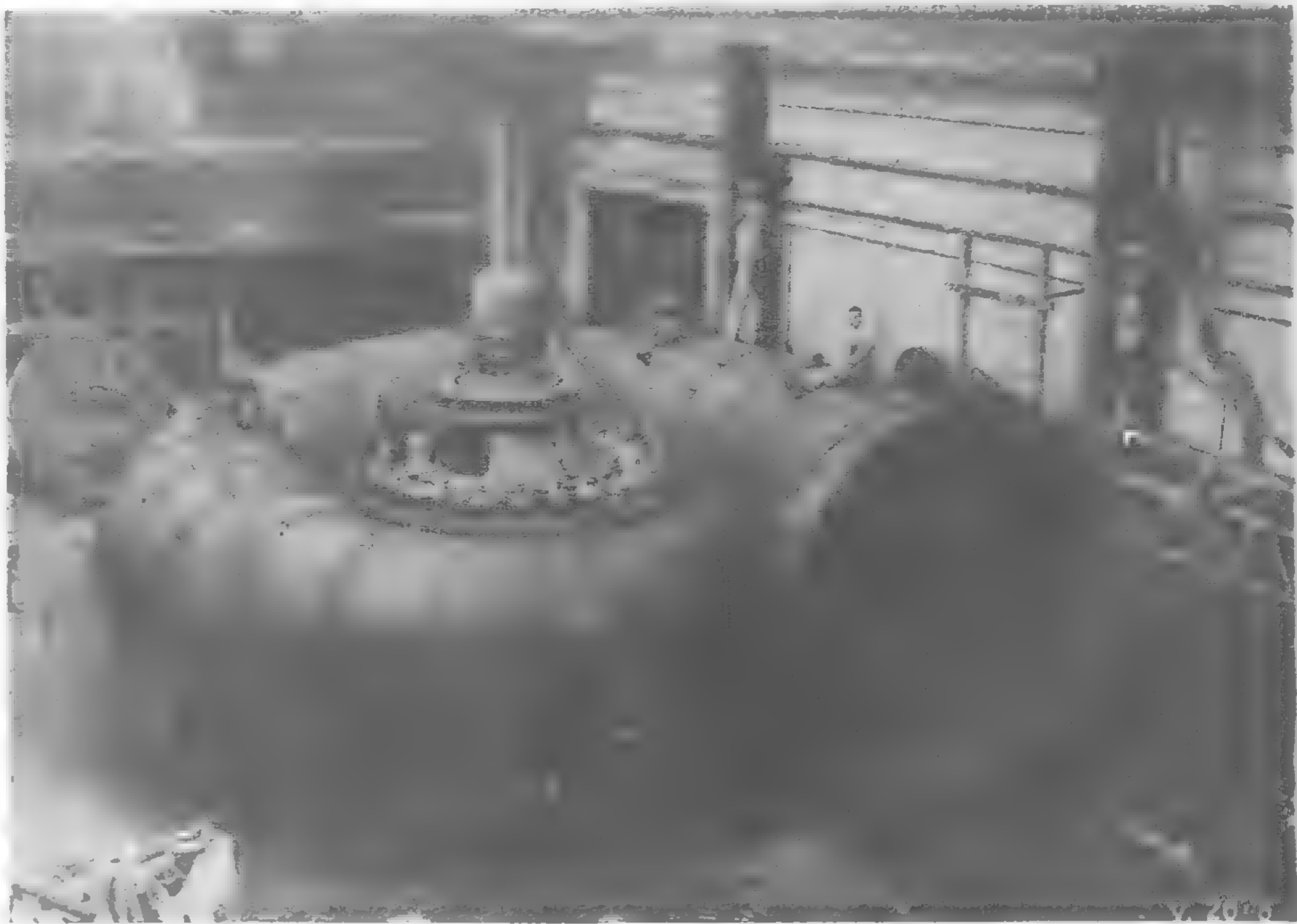
Total Height	..	262 feet
Diameter of Tank	..	41.5 "
Capacity	.. ..	965,000 gal.

#### SAND-SETTLING POND

Length	.. ..	600 shaku
Width	.. ..	180 "
Average Depth of		
Water	.. ..	20 "
Area	.. ..	2,170 tsubo

A complete view of Dam and Sand-Settling Pond etc. from the top of a mountain down the river.

Most branches of industry have continued much in the same shape since the termination of the World War, and the business world has been passing through an extended period of depression. The Kanto earthquake and fire inflicted another blow, by reducing to ashes an important proportion of our wealth, to make that depression still more acute. Amidst all these discouraging surroundings, the electric utility industry has been able to manage its affairs comparatively satisfactorily and to continue to enjoy some degree of prosperity. The increasing labor agitations naturally have turned the attention of industrial proprietors to the thought of effecting economy in labor bills, by making use of more mechanical devices. As these mechanisms require electricity for their driving power, the demand for electricity has been on the increase. The hydro-electric industry is thriving and, consequently, turbine makers are moderately prosperous, presenting about the only bright spot in the otherwise uniformly gloomy picture shown by general manufacturing industries. The turbine makers seem to have solved the intricate labor problems and again enlist full



J. M. Voith Spiral Turbine with vertical Shaft for the Omine Power Plant, Japan, 12,500 H.P. at 21.3 m. head, 150 r.p.m.

labor co-operation, so as to successfully compete with foreign rivals.

#### XX—LABOR PROBLEMS AND AUTOMATIC CONTROL POWER PLANT

The hydro-electric industry has been keenly awake to the necessity of instituting many changes in its operating methods, in connection with the influx of labor issues into this country. Labor-saving devices, of course, have been resorted to as in many other lines of industrial activities. But the outstanding development in this particular industry is the perfection of its automatic control arrangement. Because of the fact that by the nature of the industry many power plants are erected in trackless lonely spots in the mountains, and the isolation of station operatives in these places far away from cities and towns is undesirable if means can be provided for not doing so, the automatic control device just fits this need; and Japanese electric machinery makers were quick to perceive its possibilities, and many different devices for the same purpose having special features of their own have been completed.

Some amount of publicity work by the makers of these devices, emphasizing the need of hydro companies to install them, reached responsive ears, and their installation is multiplying every month,

and old power plants have been converted to the automatic control system in great numbers. This is evidenced by the fact that, whereas about three years ago this device was installed only in power plants of an output capacity of from 2,000 to 3,000 horsepower, at the present time units of 10,000 horsepower or more are now automatically controlled. These automatic devices are certainly very dependable and easier to control than operators, and indications are not lacking that almost all power stations, not only those in the inaccessible corners of the country, will be ultimately made automatic.

#### XXI—ADVANCEMENT OF INDUSTRIAL KNOWLEDGE AND PATENT RIGHTS WAR.

Advancement of industrial knowledge, as exemplified by the equipment of hydraulic motive power machinery with such a complicated mechanism as the automatic power control device, is making manufacturers eager to evolve new devices, with the result that their number is multiplying every day. As a consequence, competition for taking out as many patent rights as possible has arisen, in order to make sure that others are not permitted to use similar devices without the consent of the originators.

Since Japan is a signatory to the industrial property rights protection agreement, and as its patent law affords protection to individual inventors, it is natural that all originators of new ideas and devices seek such privilege. The number of patents secured in this country by home and foreign firms for every new device is gaining at a rapid pace. The result is that, with the exception of many publicly known contrivances, for all new features devised for turbines and their regulating systems, patent rights must be secured; as a failure to do so would expose their originators to the danger of fellow manufacturers obtaining their monopoly to undermine the interests of their legitimate owners.

When carried to the present extreme, however, such a practice necessarily renders useless many devices which otherwise could be made public property, for further improvement through active employment. As a matter of fact, barely 20 per cent. of all the patent rights are in full use, and this rule holds true with the patents for turbines and accessories. Seen from the standpoint of turbine marketing, these patent rights are comparatively of little help for attracting buyers, and merely end in being embellishments of specifications. For business after all flows to the manufacturer who is an adept in salesmanship. Manufacturers who are not so gifted cannot hope to secure business in which to use their many

patent rights for their own good and for the good of the industry at large. The manufacturer who has successfully obtained an order might use such patents by the payment of a fee to their owners. But at present no way is open for such a course, with the result that countless numbers of useful patented devices lie waste for lack of proper arrangement, and the condition is becoming worse every day.

#### XXII—INTERNATIONAL CONTROL OF INDUSTRIAL PROPERTY RIGHTS ADVOCATED

We wish to emphasize the necessity for providing ways and means for preventing the nullification of many patent rights, and for obtaining the full benefit of the numerous inventions for the common welfare of mankind. We advocate that the World Power Conference be made the medium for correcting this deplorable invalidation which takes place, by starting the international control of industrial property rights. In order to take full advantage of any patent rights, means must be devised for making them available to the users as well as the buyers of machinery which embody the principles of such patents. Until such a link is established, the patent rights lie dormant. For example, if a manufacturing plant owning a valuable patent, which increases the operating efficiency of machinery, fails to obtain business, there is no way of having that patent right accomplish anything. At the same time even if the buyer of that machinery should want this patented feature embodied in his machinery, that cannot be done unless that particular manufacturer happens to have the patent. In the same way the inventor fails to have the satisfaction of his invention being put to active use because the factory, having the title to his patent rights, failed to get the business.

Such instances are by no means rare. There are occasions where manufacturers book orders and approach the patent owners for permission to use their patent, and there are instances on record where the necessary permission has been granted on terms, but usually such proposals to utilize the patent of another are refused, because of professional jealousy.

And this is about the fate of most patent rights which are daily taken out. The only solution of this difficulty, under the circumstances, must be an international organization to assemble all patent rights in the signatory countries, and from which any manufacturer can secure upon the payment of a suitable fee, the rights of use of any desirable patent to embody it in the machinery he is going to produce.

The membership of this international organization, or the clearing house for industrial patents, should comprise patent owning manufactories or individuals in all countries of the world who should place their patent rights in the custody of the organization. The method of finding employment for these patents, and the amount of fee for their employment, should be fixed at the discretion of the organization, whose decision shall be final. An executive committee should be appointed by the vote of its members, and the institution could function very much in the same fashion as the present League of Nations. Rental schedules for the patent rights could be determined by the resolution of the league committee, and a part of the income obtained by the renting of the rights could be retained by the league as commission. Further details of the operating method of this organization could be fixed after due deliberation.

A casual survey of the patent situation in most countries of the world discloses the fact that only in rare cases do patents cover original discoveries, the majority being mere improvements. Usually the latter embody the essential feature of a desirable improvement, but the weakness of these improvement patents lies in the fact that, in the majority of cases, they could easily be circumvented to a great extent by another device which, if not as good as the patented one, could answer the same purpose. This explains why patent rights on first class improvements are sent to oblivion, because of their patent walls, without inconveniencing outsiders. This situation accounts for most of the high grade improvement patents failing to contribute fully to the welfare of mankind when put into active use, as second grade devices are substituted everywhere.

The accepted main motive of patent rights owners is to monopolize the benefits accruing from such rights, but the happy realization of such a purpose is impossible, except in cases of a discovery of an extraordinary character which forbids any duplication. The owners of patent rights of this class naturally will be lukewarm to

such an international organization as was propounded, as their rights are easily protected, and their interests will be promoted without its aid. But the average patent owner ought to be willing to avail himself of such a project, as it will prove the means of amply rewarding the inventor for his long toil, making the invention of one country accessible to all other nations of the world, so as to share its benefits and to improve industrial efficiency at large.

In these days of international agreements for settling differences between countries, and even for reducing first line battleships, by the leading nations of the world, by means of the League of Nations and the Washington Conference, there can be no reason why an international association for the better use of patent rights, as a common blessing to humanity, cannot be started and maintained successfully. If this association is impossible for machinery of all descriptions, we suggest making a beginning within the sphere of hydraulic machinery. Already we hear that a group of great manufacturing concerns in a certain Occidental country have concluded, and are enforcing, an agreement for the reciprocal use of their patent rights. This shows that necessity gave birth to this agreement in that country. What remains to be done will be to make this movement international in scope.

#### XXIII—DIFFUSION OF HYDRO-ELECTRICAL FACTS

As explained above, the development of hydro turbine manufacturing in Japan had a close relation to the progress in the art of steel making, more especially in the manufacture of cast-steel. The successful development of this latter branch of the iron and steel industry has contributed much toward an equally successful exploitation of turbine making. This project has also been greatly aided by a well appointed laboratory, maintained by every turbine factory, for research work in hydro-dynamics, where the most thorough and painstaking study is conducted, and its result is applied to the manufacture of turbines with noteworthy results. Hydro-dynamics occupies an important place in the program of general education, and fairly well fitted laboratories now complete the equipment of hydro-dynamics classes of the universities and technical schools for practical demonstrations. Of recent years grammar school children are given adequate education with respect to the hydro sites and important streams in their locality, as well as regards the extent of the application of hydro-electricity, which augurs well for a continued expansion of electric utility and the allied industries.

All this is what it should be in view of the fact that, whereas coal deposits in this country for steam electric plants are of restricted proportions, its potential hydro resources take precedent with 10,000,000 horsepower according to the estimates of the Communications Department. The geographical position of Japan along the Pacific Ocean, its distribution of atmospheric pressure and other meteorological conditions, assuring adequate rainfall, make it one of the most important hydro-electric countries of the world. The spread of adequate hydro education and the conducting of painstaking research are twin necessities for encouraging many valuable inventions and improvements for the manufacture of turbines, for harnessing these resources and for contributing something to the promotion of the happiness of the human race.

#### XXIV—SPREAD OF KNOWLEDGE AND THE FUTURE OF THE INDUSTRY.

Finally we wish to emphasize the need of standardization of the hydro-electric project, one of the important institutions of civilization. This may sound contradictory to our statement in earlier chapters, but the failure of the effort for standardization in the earlier stage of hydro turbine making does not constitute adequate ground for forever tabooing such effort, when the industry has attained a certain degree of development to warrant such a step. Standardized designing of turbines in the embryonic stage of hydro technique development in America ended in failure, largely because of a lack of adequate information on turbine designing. Because of the fact that every hydro turbine is designed and constructed in accordance with the desire of each individual buyer, and as each set is turned out based on the available knowledge and result of research work of that time, its performance is by no means uniform. At the same time, the technical side of the project offers much difficulty as the subject of study covers a wide range.

If another effort at standardization is made along the lines which American manufacturers followed, but, this time, based on the amplified theory and practice of to-day, the production

of the most efficient and durable of motive power machinery can be effected, to put the industry on a sounder and more dependable foundation. The manufacture of hydro turbines on this principle must be done by restricting their design within a certain scope, and must be so designed as to insure a maximum uninterrupted output. Hydro utility companies, on the other hand, will be required to select their hydro sites, which come within the scope of these standardized turbines, with which to equip the plants. What the utility firms lose by this limitation will be amply compensated for by the permanent gain in efficiency.

## Development of Water Tube Boilers in Japan

(Continued from page 312).

function satisfactorily. However, it was found, after the continuous firing extending over one month, that, not only the temperature of gas in front of water tubes as well as in flue was found remarkably low, but also no trace of clinkers or fused ash sticking on tubes and brick wall was observed, despite of the fact that the very low grade brown coal (Kwainei coal) with low ash fusing point was used as fuel. These features are shown in two photographs reproduced here.

This test endorsed the future possibility of remarkable development of the boiler as used for pulverized firing.

Takuma boiler of larger capacity can be designed, as is shown in Fig. 13, by combining two sets of boilers facing each other, with tube wall at the back and tube screen at the bottom, thereby making the boiler adaptable for higher rate of combustion, and absorbing radiant heat effectively at the same time.

There is another proposal for possible improvement of Takuma boiler, with simple modification in its design, and to assure a better absorption of radiant heat. In this type of boiler, are fitted, as is shown in Fig. 14, outside of the original boiler proper, tube walls, one in its front, the other on its side: the latter connected directly to upper drum, thus doing away with header which is liable to disturb water circulation.

It can be said that the "Takuma" boiler is the first and unique amongst all others, in that it accomplished for the first time in the history of steam engineering, perfection of water circulation well stabilized and at its high speed, through the means of its water

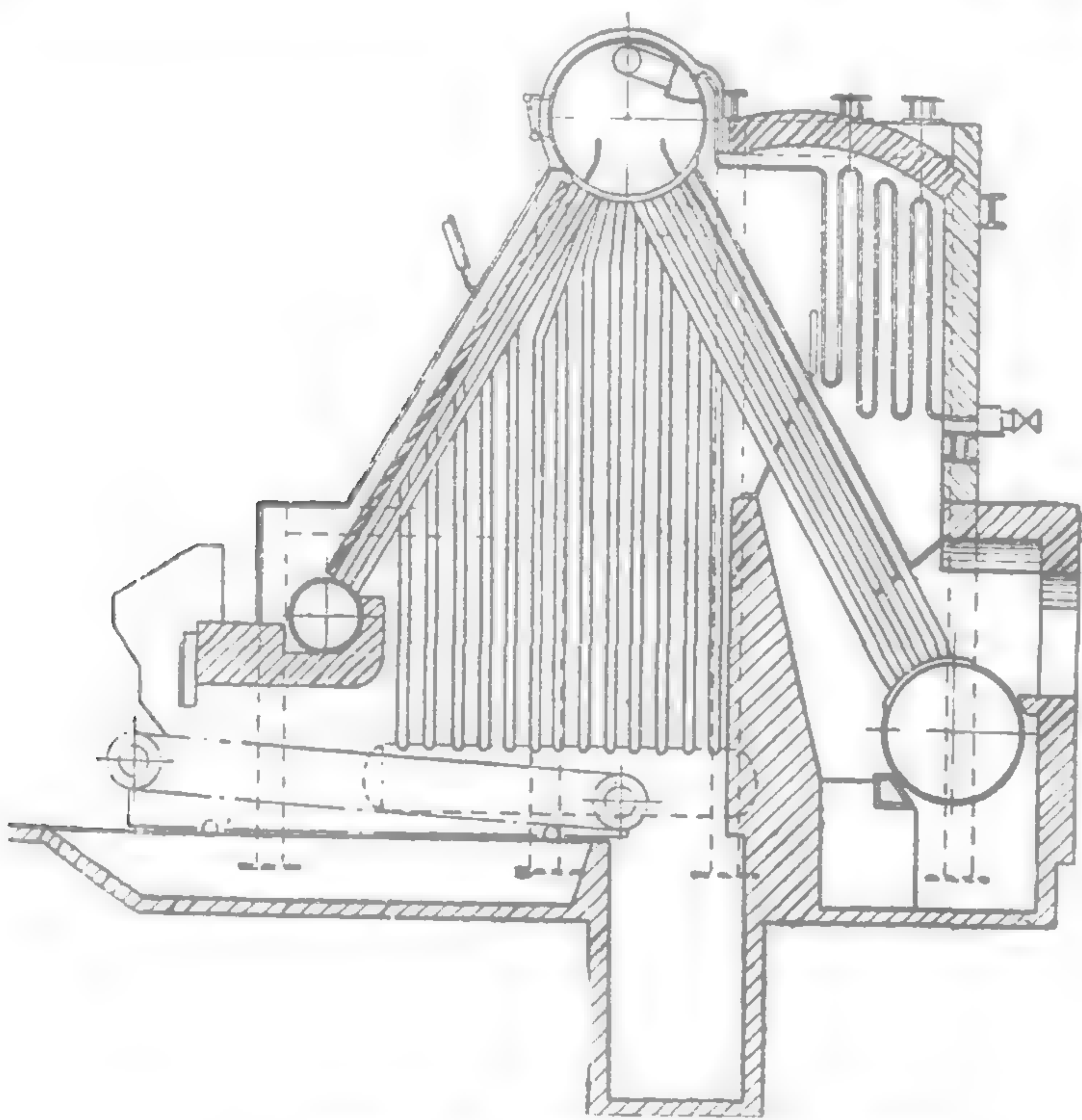


Fig. 14.—Takuma Boiler, one Type of New Design

receptacle, insulated shield, and marvelous functions assured of down-take tubes by simple and ingenious devices embodied in the boiler design. For the boiler of still larger capacity, an additional installment of tube nest set vertically on the lower drum will be sufficient.

It can, therefore, be said that "Takuma" boiler has for it, the most promising future, because of its adaptability for pulverized firing of almost any fuel and of its facility for attachment of tube walls and tube screen as well as of its flexibility at high pressure and temperature, besides its characteristic of ensuring natural and undisturbed circulation with consequent high rate of evaporation.

## Yarrow Land Boilers

The following orders for Yarrow Land Boilers have recently been received:—

H. M. Dockyard, Devonport North: (Repeat Order); One unit, comprising Yarrow Boiler and Superheater with Economizer in series.

Heera Mills, India; Three units, each comprising Yarrow Boiler and Superheater with Economizer in series.

Geertruidenberg Power Station: (Third Repeat Order); Two units, each comprising Yarrow Boiler and Superheater with Economizer and Airheater in series. The evaporation per boiler is over 150,000 lbs. at 570 lbs. per square inch working pressure, the final steam temperature being 797°F.

Nijmegen Power Station: (Repeat Order); Two units, each comprising Yarrow Boiler and Superheater with Economizer and Airheater in series.

Japanese Government: One Yarrow Boiler and Superheater with Economizer in series.

Ellangowan Paper Mills: One Yarrow Boiler and Superheater with Economizer in series.

J. Lyons and Co., Ltd., Cadby Hall: (Second Repeat Order); One unit, comprising Yarrow Boiler and Superheater with Airheater in series.

H. M. Dockyard, Devonport North: (Second Repeat Order) One Yarrow Boiler.

## Norge Refrigerators

A new improved type of electric refrigerator is being placed on the overseas market by the Norge Corporation, subsidiary of the Borg-Warner Corporation.

This new Norge refrigerator is shipped directly from the factory and may be assembled and installed after performing a few simple operations. The freezer, connecting tubing and condensing unit may easily be installed or removed together without moving the cabinet. Tube openings in the back of the cabinet are unnecessary in this device.

The compressor is known as the Norge Rollator and is quite a refinement over the rotary type, the manufacturer claims. A roller turns smoothly within a cylinder and performs the function necessary to refrigeration. This principle eliminates the necessity of the piston, connecting rod and many other moving parts. The Rollator is permanently quiet, as the three principal parts operate submerged in oil, which insures less friction and gives it longer life, thus lowering operation costs, the company officials claim.

The freezing unit is equipped with vertical downdraft flues which provide increased air circulation over the freezer and causes the cabinet temperature to lower quickly. The large ice-cube compartment is enclosed by a self-closing porcelain door which prevents the cubes acquiring flavor from food odors. This door also prevents the forming of frost on the trays, thus making them always easily removable.

A cold accelerator, adjustable to five points is located on the front of the ice cube compartment. Combined with it is a switch used for starting and stopping the unit.

The cabinets are furnished in four, five and seven cubic foot sizes and are exceptionally sturdy in construction and scientifically insulated.

The four foot size has a bonderized lacquer exterior and a vitreous porcelain interior. The five and seven foot sizes have porcelain on both the interior and exterior. The especially designed hardware is of stamped and cast brass with a finish of chromium over nickel. The design of the door latch permits closing without slamming. The spacious shelves are of heavy parallel bar construction. They are hot welded and triple tinned.

A porcelain chill tray for crisping salads and storing foods which must be kept unusually cold is part of the standard equipment of each refrigerator. Norge export sales are handled by the Willys Export Corporation of Toledo, Ohio, U.S.A.



## O.S.K.'s New Passenger and Express Cargo Liners

The Company to Operate Eleven New Motorships; Enormous Building Program Nearing Completion

THE most striking feature in Japan's recent development of her mercantile marine is the replacement of her old steam freighters by fast and economical motorships. Not only the N.Y.K., and the O.S.K., but many smaller shipping companies are building Diesel engined ships to replace steamers now engaged in tramp cargo services. The most significant of all, is the remarkable improvement of its cargo services by the Osaka Shosen Kaisha.

This company has decided to place on its New York Line four new Sulzer engined cargo ships of 8,400 tons each: the *Kinai Maru*, the *Tokai Maru*, the *Sanyo Maru*, and the *Hokuroku Maru*.

These ships are now being built at the Nagasaki yard of the Mitsubishi Shipbuilding and Engineering Co., Ltd., and the first ship of the four, the *Kinai Maru*, is to enter into active service in July. In addition, two cargo motorships of 8,600 tons each, the *Kanto Maru* and the *Kansai Maru*, equipped with M.A.N. engines, now being built by the Yokohama Dock Co., Ltd., for the Kishimoto Steamship Company are to be chartered by the O.S.K., under a five year contract and operated on its New York Line.

On its Australian line, the O.S.K. is to place three Burmeister & Wain engined cargo ships of 5,500 tons each: the *Sydney Maru*, the *Melbourne Maru* and the *Brisbane Maru*. The *Sydney Maru*,



Australian Liner "Sydney Maru," Built to the Yokohama Dock Co., Ltd. Equipped with Burmeister & Wain 4 Cycle, Single Acting, Airless Injection Engine, 3,000 B.H.P.

the first of the trio, built by the Yokohama Dock Co., Ltd., was placed in service last December, while the remaining two are now being completed at the same yard.

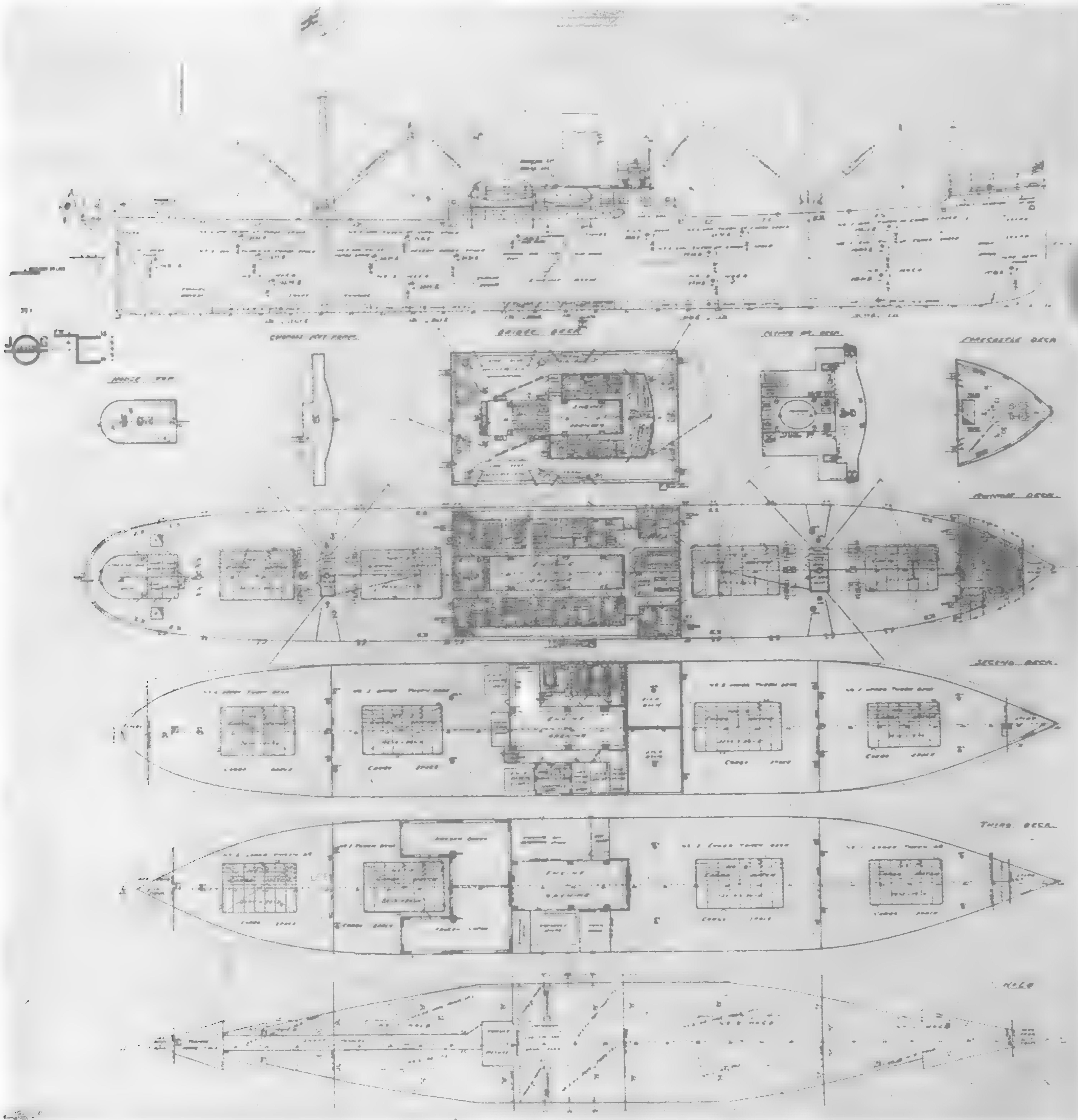
Two more Sulzer Diesel engined semi-cargo ships of 9,600 tons each, the *Buenos Aires Maru* and the *Rio de Janeiro Maru*, are now operating on the O.S.K.'s South American Line; the former, built at the Mitsubishi Nagasaki yard, having been in service since November, 1929, with perfectly satisfactory results, while the latter has just been completed at the same yard to be placed in commission on the same run by the beginning of June. (The full description and plans of the *Buenos Aires Maru* appeared in the May issue of the *Far Eastern Review*).

All told, the company will operate eleven new motorships, aggregating 86,000 tons, on its overseas lines under its own flag (including the two Kishimoto's ships now under construction) in addition to the thousands of new motorship tonnage recently built for its coastwise and China services, including the *Ural Maru*, a geared turbine engined ship of 6,400 tons, now on the Dairen run, and the *Sumire Maru* and the *Midori Maru*, two sister ships of nearly 2,000 tons each, equipped with Mitsubishi-Vickers engines,

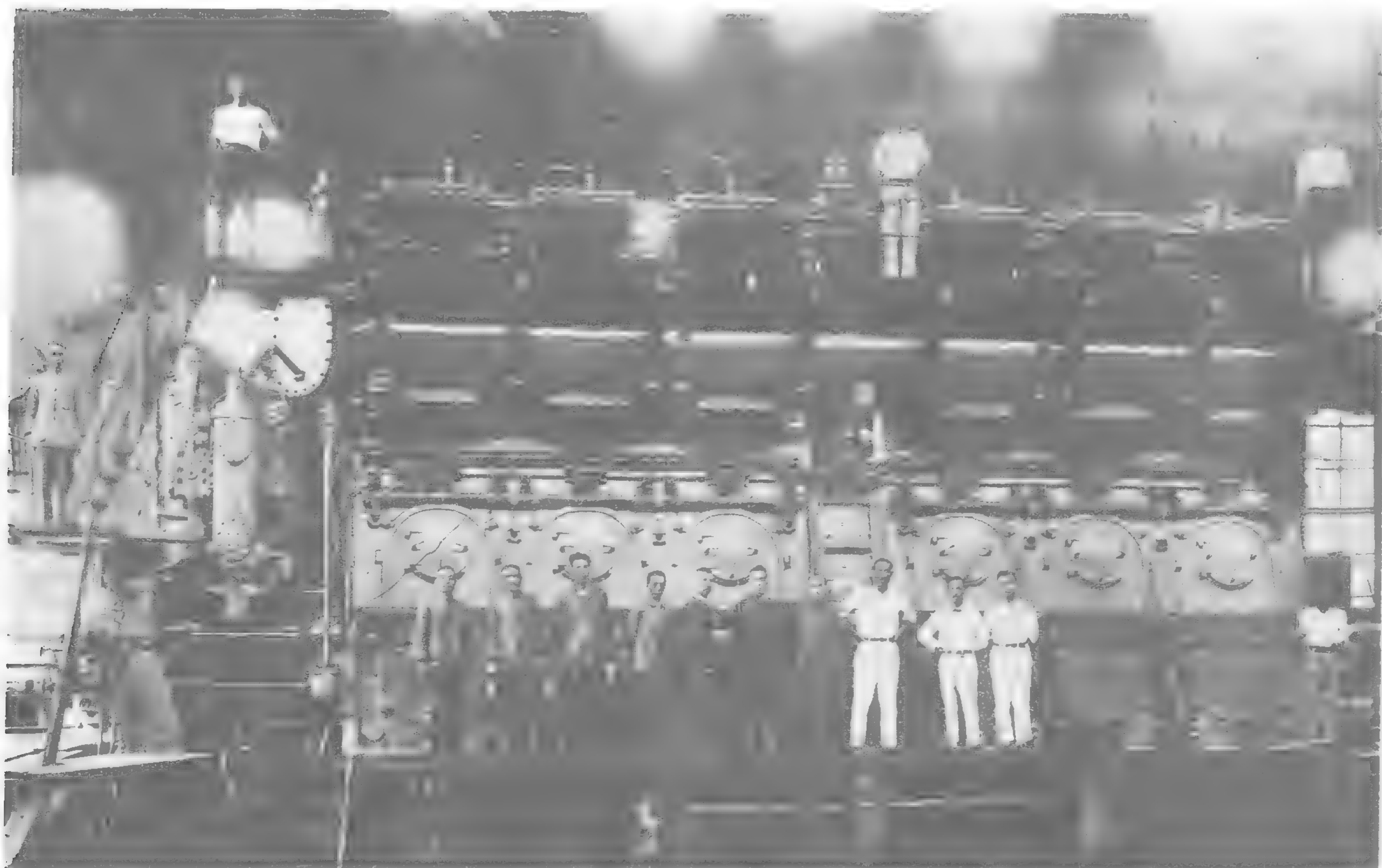
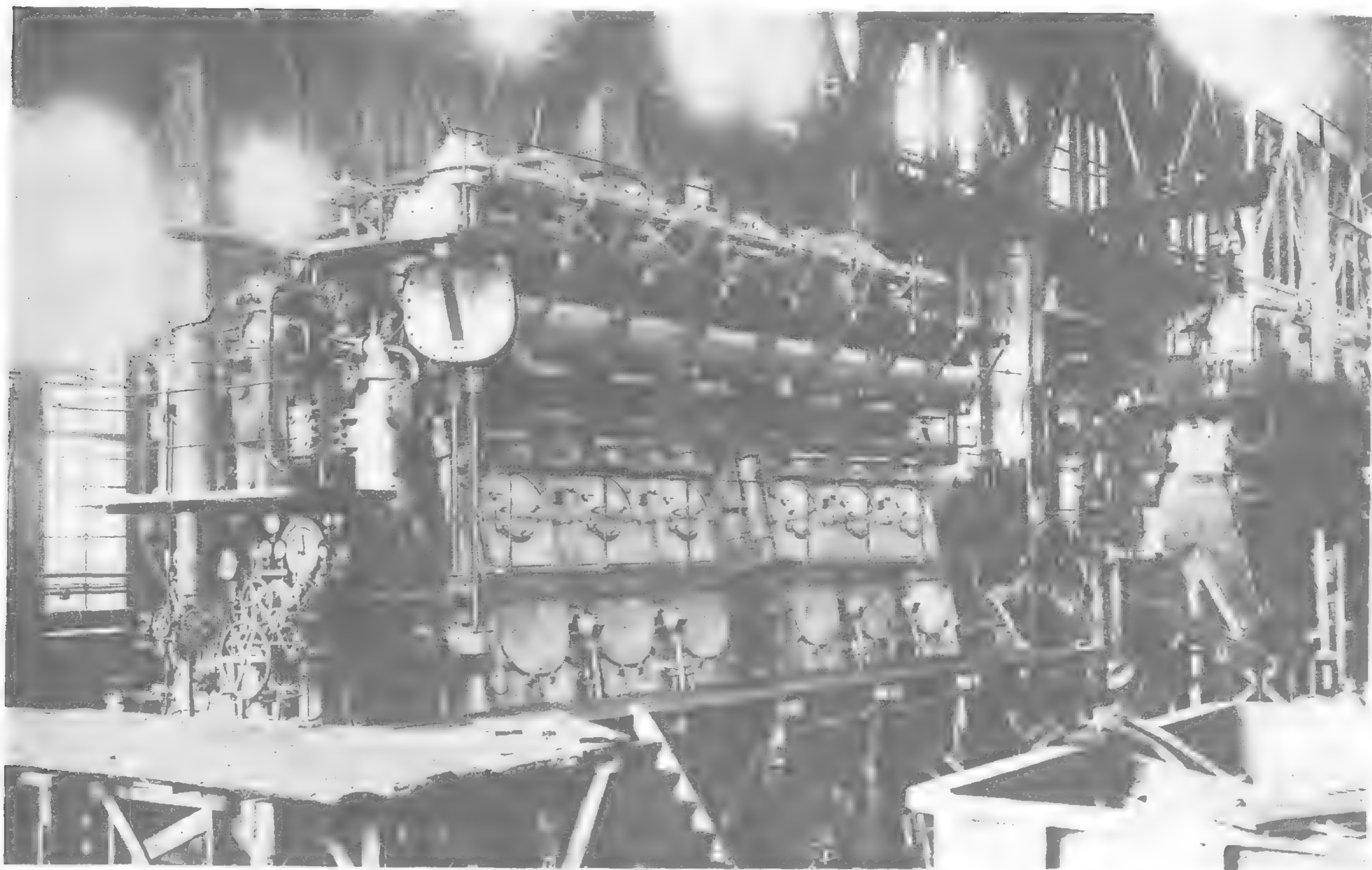
for its Inland Sea Service. (These vessels were described in the April 1929 issue of the *Far Eastern Review*). The present article deals with the six ships on the New York Line, the three on the Australian Line, and two on the South American Line. Their particulars follow:

Name of Ships	Tonnage (Gross)	Engines	Builders	Begin Service	Lines
<i>Kinai Maru</i> ..	8,395	Sulzer	Nagasaki	July, 1930	New York
<i>Tokai Maru</i> ..	8,395	Sulzer	Nagasaki	Sept. 1930	New York
<i>Sanyo Maru</i> ..	8,395	Sulzer	Nagasaki	Nov. 1930	New York
<i>Hokuroku Maru</i> ..	8,395	Sulzer	Nagasaki	Dec. 1930	New York
* <i>Kanto Maru</i> ..	8,580	M.A.N.	Yokohama	Sept. 1930	New York
* <i>Kansai Maru</i> ..	8,580	M.A.N.	Yokohama	Dec. 1930	New York
<i>Sydney Maru</i> ..	5,436	B. & W.	Yokohama	Dec. 1929	Australia
<i>Melbourne Maru</i> ..	5,436	B. & W.	Yokohama	Apr. 1930	Australia
<i>Brisbane Maru</i> ..	5,436	B. & W.	Yokohama	Dec. 1930	Australia
<i>Buenos Aires Maru</i>	9,626	Sulzer	Nagasaki	Nov. 1929	S. America
<i>Rio de Janeiro Maru</i> ..	9,626	Sulzer	Nagasaki	June 1930	S. America

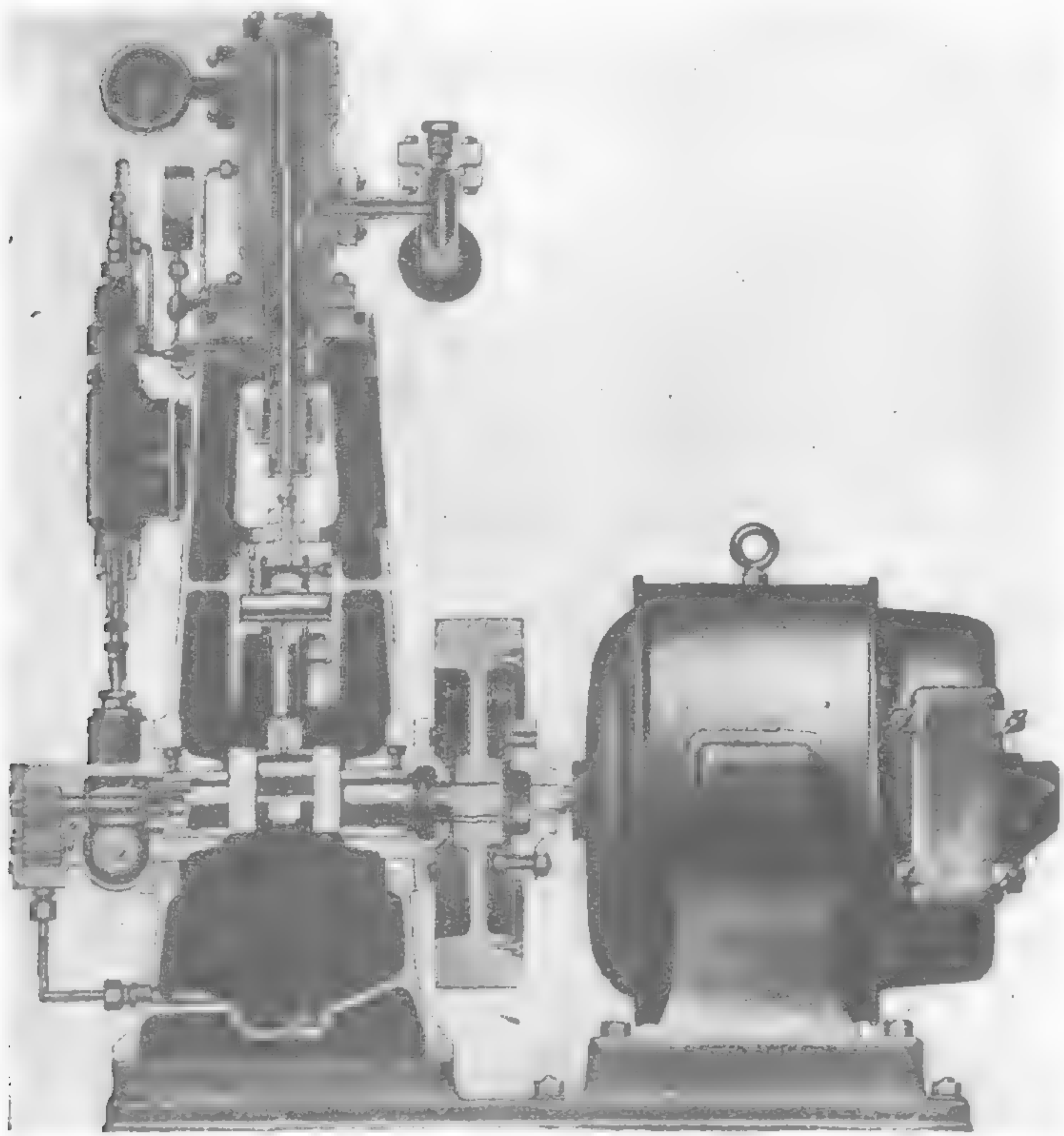
\* The M.A.N. engined ships, the *Kanto Maru* and the *Kansai Maru*, are being built for the Kishimoto Steamship Company and are to be chartered by the O.S.K. under a five year contract.



General Arrangement of O.S.K.'s New Australian Liner "Sydney Maru"



Main Engine of the "Buenos Aires Maru" and Her Sister Ship "Rio de Janeiro Maru"; Sulzer 2 Cycle Single Acting, Airless Injection Engine 6 x 680 x 1,000; 3,000 B.H.P.



Sectional View of Sabroe CO<sub>2</sub> Compressor with Motor, Installed in the New O.S.K. Australian Liners

In the names of builders, "Nagasaki" stands for the Nagasaki yard of the Mitsubishi Shipbuilding & Engineering Co., Ltd., and "Yokohama" for the Yokohama Dock Co., Ltd.

Express Cargo Service

Upon completion of the six new ships to be placed on the New York Line, the O.S.K. will inaugurate an "express freight service," covering the distance between Yokohama and New York in 28 days, including one day's stop at Los Angeles, by maintaining a service-speed varying from 15 to 16 knots. The fastest vessel now operating on this line requires more than 30 days to make the run.

The New York Line of the O.S.K., started in 1920, has now five steamers of 6,000 tons each on the run. Besides the O.S.K., there are a number of Japanese and foreign shipping concerns also operating a similar service. Most of the Japanese vessels now on

the run, however, are so old that they can hardly compete with the excellent service offered by the newer foreign ships. Now comes the O.S.K. with its proposal to provide the best service so far available for this trade.

Following the lead of the O.S.K., it is reported that the Kokusai Kisen K.K. has decided to build two Diesel-engined ships of 9,300 tons each to be placed on the New York run, while the N.Y.K. is also planning the construction of four 10,000 ton class cargo motor-ships to operate on this line.

The O.S.K. laid down its program for building the four Diesel cargo vessels for the New York Line early in 1929, placing the order with the Mitsubishi Shipbuilding & Engineering Company. The keel of the first ship, (the *Kinai Maru*) was laid on October 1, 1929, and the vessel launched on April 1, 1930. The *Kinai Maru* will be completed by the middle of June, and begin service in July.

The leading particulars of the *Kinai Maru*, and her three sister ships, the *Tokai Maru*, the *Sanyo Maru*, and the *Hokuroku Maru*, are as follows :

Length over-all	...	...	...	...	463-ft. 6-in.
Length, b.p.	...	...	...	...	445-ft. 0-in.
Breadth moulded	...	...	...	...	60-ft. 0-in.
Depth moulded	...	...	...	...	40-ft. 9-in.
Tonnage :					
Gross	...	...	...	...	8,395 tons
Net	...	...	...	...	5,090 tons
Dead weight	...	...	...	...	10,090 tons
Draught :					
Loaded	...	...	...	...	26-ft. 0-in.
Light	...	...	...	...	13-ft. 1½-in.
Capacities :					
Grain	...	...	...	...	15,440 tons
Bales	...	...	...	...	14,300 tons
Passenger accommodation	...	...	...	...	six (first class only)

The *Kinai Maru* and her sister ships, are super structural vessels of Lloyd's 100 A1 class, fulfilling all the requirements of the Tei-shinsho (the Japanese Department of Communications), Special Survey and other shipbuilding, inspection and load-line rules and laws. They have two masts, six imposing derrick posts, and one enormous funnel, with a raked straight stem, cruiser stern and three decks.

Special attention has been paid to the general arrangement of cargo facilities in the construction of the *Kinai Maru* and her sister ships. The two masts and six derrick posts are equipped with 21 booms and 20 winches. All winches are of the Mitsubishi standard type, electrically driven with automatic accelerative device ; nine are capable of lifting a load of five tons at a speed of 130 feet per minute, while eleven can lift a load of three tons at a speed of



Mitsubishi-Sulzer Diesel Engines for the New O.S.K. South American Motor Liner "Rio Janeiro Maru"

100 feet per minute. In addition, there is a heavy cargo derrick of 20 tons.

In view of the fact that the winches, windlasses, refrigerating apparatus as well as the telemotor steering gear and other equipment are operated electrically, the *Kinai Maru* and her sister ships will be furnished with three sets each of 260 K.W. Mitsubishi type solid injection Diesel driven generators built jointly by the Kobe Works of the Mitsubishi Shipbuilding & Engineering Company and the Mitsubishi Machinery Works at Nagasaki. These are the largest ship-dynamos built in Japan.

The *Kinai* class vessels will be furnished with stream-lined rudders and shaft brackets, designed to diminish the resistance of the hull to minimum.

### Main Engines

The main propelling machinery consists of two sets of Mitsubishi-Sulzer 2 cycle, single acting Diesel engines, each having six cylinders of 680 m.m. diameter, and 1,200 m.m. stroke, rated at 7,200 B.H.P. (designed). They have two cast steel boss propellers each, with four bronze blades, 14-ft. 0-in. in diameter. One Cochran boiler (4-ft. 6-in. by 11-ft. 6-in.) with a working pressure of 100 lbs. per square inch, is used as the donkey boiler.

The *Kinai* class vessels are fitted with four deep tanks for oil-in-bulk; two are located in the fore part of the ship, one on the port side having a capacity of 192.45 tons, and the starboard one 196.55 tons; the aft port tank has a capacity of 304.93 tons and the starboard one, 311.93 tons. These deep tanks have been divided into compartments to handle bulk shipments, varying from 200 to 1,000 tons.

There are six silk rooms on each of these four vessels with the following capacities: fore part of the ship, port, 186.0 tons, center, 52.14 tons, starboard, 186.0 tons; after part of the ship, port, 183.49 tons, center, 66.7 tons, starboard, 183.49 tons. By use of these six silk rooms, the vessel can undertake three different kinds of shipments, *i.e.*, discharge at Los Angeles, discharge at New York, and at option between New York and Los Angeles. It takes about 83 hours to cover the distance by rail between Los Angeles and New York, comparing favorably with similar shipments *via* Seattle or San Francisco.

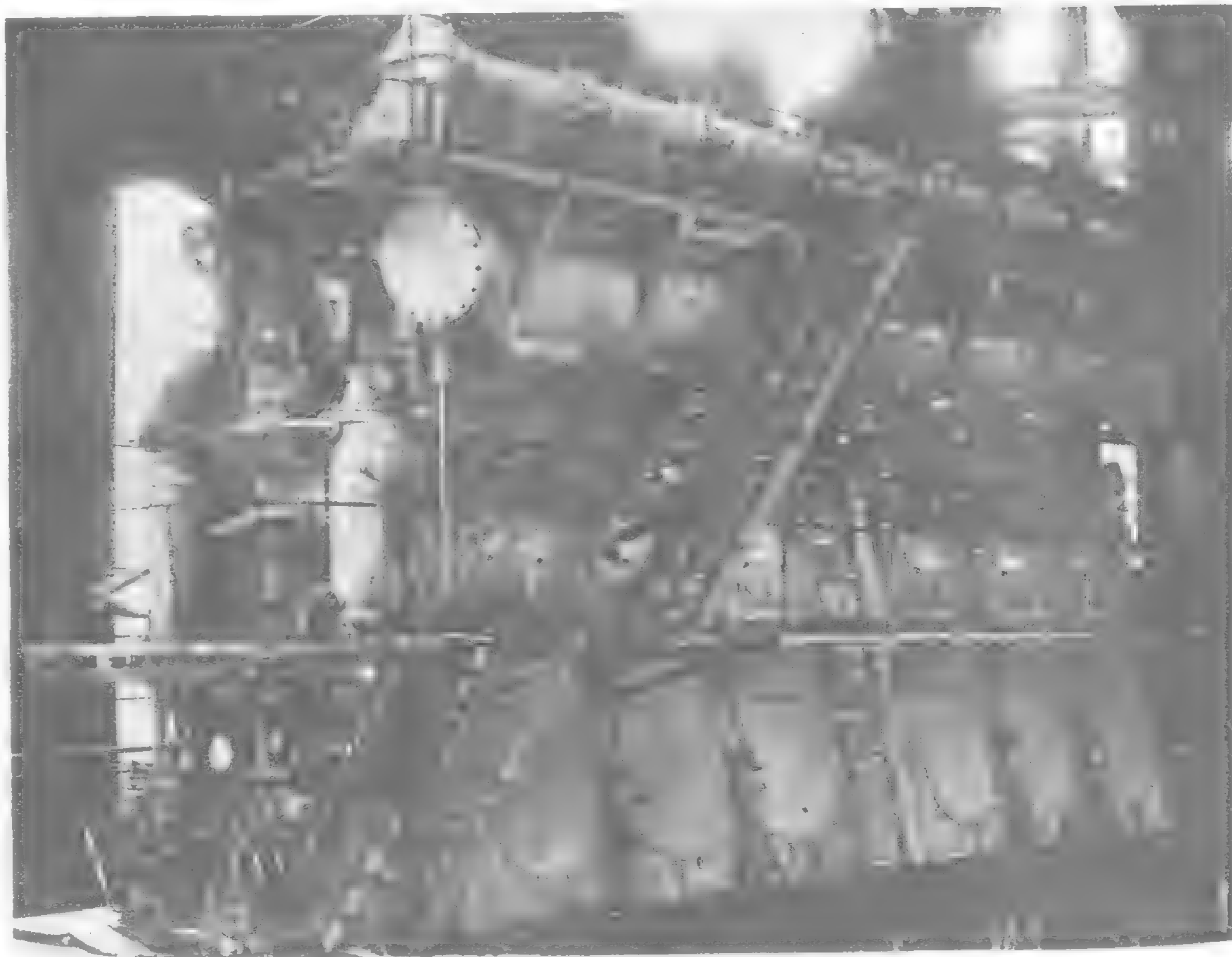
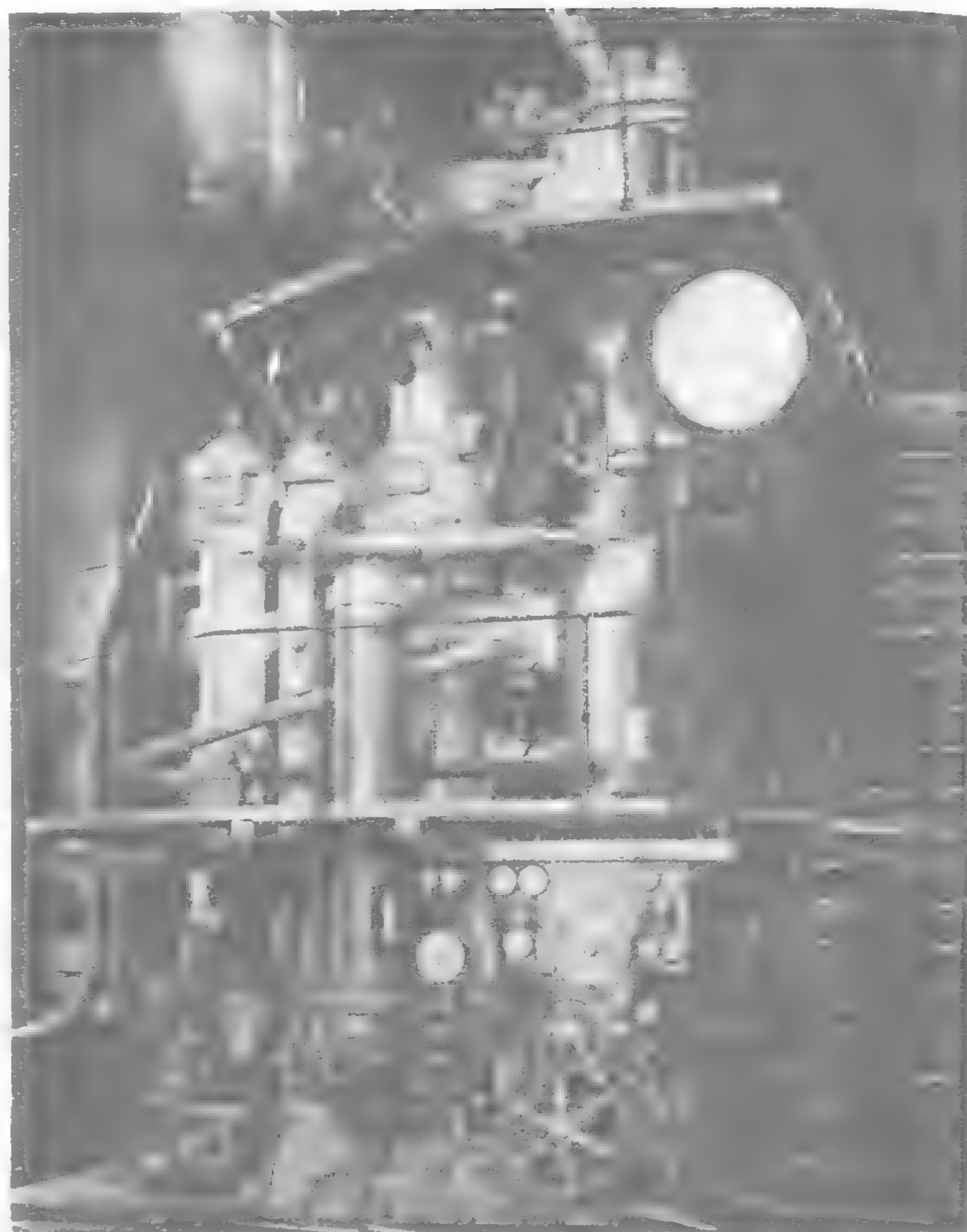
There are four cold storage compartments on each of the *Kinai* class vessels, their capacities being: fore part of the ship, port, 65.8 tons, starboard, 65.8 tons; aft part of the ship, port, 89.2 tons, and starboard, 89.2 tons. Regardless of climatic conditions, the vessels are capable of standardizing the temperature at 15 degrees F.

These vessels are also provided with a 50 ton magazine compartment for the transportation of chemicals, turpentine, acetone, rubber cement, paint, and explosives, imported into Japan from the United States.

Apart from the foregoing excellent cargo facilities and arrangements, the O.S.K. pays special attention to the safety appliances throughout the vessels, particularly in connection with the cargo transportation, each one of these ships' holds being water-tight compartments with fire-proof walls; in addition, the CO<sub>2</sub> fire extinguishing system is installed.

### "Kanto" and "Kansai Maru"

The particulars of the Kishimoto Steamship Company's ships, the *Kanto Maru* and the *Kansai Maru*, are as follows:



Side and Front Views of Main Mitsubishi-Sulzer Diesel Engine for the O.S.K. M.S. "Kinai Maru"

Length, b.p. 460-ft. 0-in., Breadth moulded 61-ft. 6-in., Depth moulded 39-ft. 9-in. Tonnage: Gross, 8,580 tons; Net, 5,140 tons; Dead Weight, 10,800 tons; Draught (loaded), 27-ft. 6-in.; Capacity, 12,356 tons (dry cargo only)

No passenger accommodations.

The *Kanto Maru* and the *Kansai Maru* are to be equipped with M.A.N. Diesel engines. At present, three vessels, in addition to the above, are under construction in Japan to be fitted with M.A.N. engines; The Yamashita Kisen Kaisha has a 7,500 ton vessel being built at the Uraga Dockyard (4,000 B.H.P. at 117 r.p.m.), and the Yokohama Dock Company and the Kawasaki Dockyard Company are each building one for the Japan Tanker and for the T.K.K. These engines are rated at 7,200 B.H.P. at 130 r.p.m. and 3,200 B.H.P., at 170 r.p.m., respectively.

The main engines of the *Kanto Maru* and her sister ship consists of two sets each of M.A.N. 2 cycle, double acting, solid injection engines, each engine having six cylinders, 600 m.m. in diameter and 900 m.m. in stroke, rated 7,500 B.H.P. at 130 r.p.m., enabling the ship to maintain a high service speed of 15 knots. These ships, like the four O.S.K. new liners on the New York run, are also equipped with three sets each of 235 K.W. M.A.N. Diesel generating sets, 4 cycle, single acting, 6 by 275 by 420, developing 350 B.H.P. each. The donkey boiler is a Cochran vertical type, diameter, 4-ft. 6-in., working pressure, 100 lbs. per square inch.

### Express Freight Service Schedule

The inauguration of the O.S.K. "Express Freight Service" on its New York Line, marks a new development in Japanese shipping enterprise. These six cargo motorships will make more than 18 round trips a year, the drawing cards of the service being safety, punctuality and speed.

On their outward voyages from Hongkong these liners will call at Keelung, Shanghai, Dairen, Taku, Kobe, Nagoya (or Yokkaichi), Shimizu (during the green tea export season), Yokohama, Los Angeles, Balfour, Christobal, terminating the voyage at New York. During the period allocated for their stay in New York, they may load or unload cargo at Boston, Baltimore, Norfolk, or elsewhere as the occasion may demand. On the return voyage they will call at Christobal, Balfour, Los Angeles, Yokohama, Kobe (or Osaka), Shanghai, and Hongkong.

The O.S.K. also plans to operate a subsidiary service on the New York run, using the *Habana Maru*, the *Haigue Maru*, and the *Aigun Maru*, to make more than six round trips a year. These ships are to be semi-regular liners making occasional calls at ports not on the regular schedule.

### The Australian Line

A cut of ten days in one round trip is the feature of the O.S.K.'s Australian service by their three new cargo motorships, the *Sydney Maru*, *Melbourne Maru*, and *Brisbane Maru*.

There are four companies now operating on the Australian run; the Eastern and Australian, N.Y.K., the Japan-Australian Line (a combination of the Yamashita Kisen K.K., Kokusai Kisen K.K. and the Kawasaki Kisen K.K.), and the O.S.K. But the ships on this service, especially those of the E. & A., and the N.Y.K., are out-of-date, some being almost 30 years old. In order to improve this service, the E. & A. in October of last year commissioned the *Nellore*, 6,853 tons, 12½ knots, built in 1913, to replace the *Arafura*, the oldest ship on the line, as a preliminary step in its new program. The *Arafura* was sold to the Osaka Kaiji Kaisha of Osaka to be scrapped. The N.Y.K. intends to place some of their present European liners on this run upon completion of the *Terukuni Maru* and the *Yasukuni Maru*, the new Sulzer diesel engined 10,000 class semi-cargo ships built at the Mitsubishi yards.

The announcement of the O.S.K. to commission these smart O.S.K. cargo motorships, specially constructed to fulfill the requirements of this run, created a sensation in shipping circles. The principal particulars of the *Sydney Maru*, first of the O.S.K. trio on the Australian Line, (which made her maiden trip in December, 1929) as well as that of her two sister ships, are as follows:

Length Over-all	...	...	...	...	396-ft. 6-in.
Length, b.p.	...	...	...	...	380-ft. 0-in.
Breadth moulded	...	...	...	...	54-ft. 6-in.
Depth moulded	...	...	...	...	34-ft. 3-in.
Tonnage:					
Gross	...	...	...	...	5,436 tons
Net	...	...	...	...	3,237 tons
Dead Weight	...	...	...	...	6,761 tons

### Draught:

Loaded	...	...	...	...	24-ft. 3-in.
Light	...	...	...	...	9-ft. 2½-in.

### Capacities:

Grain	...	...	...	...	10,022 tons
Bales	...	...	...	...	8,904 tons
Passenger Accommodations	...	...	...	...	six (first class only)

It was not until 1928 that the O.S.K. laid down its program to build these three motor cargo ships for the Australian Line with the object of promoting the growing trade between Australia and Japan, and reduce the number of days in making the voyage between the two countries. Orders were subsequently placed and the work duly progressed as shown in the accompanying table:

	<i>Sydney Maru</i>	<i>Melbourne Maru</i>	<i>Brisbane Maru</i>
Laid Down	... Dec. 12, 1928	June 19, 1929	Aug. 25, 1929
Launched	... Aug. 25, 1929	Dec. 15, 1929	Feb. 28, 1930
Delivery	... Nov. 30, 1929	Mar. 28, 1930	May 28, 1930

The construction and requirements of the *Sydney Maru*, and her two sister ships, conform to the highest requirements of Lloyd's and the Japanese Government. They have three decks, subdivided by six water-tight transverse bulkheads. Most of the double-bottom space is used as heavy fuel oil tanks. Two tall masts and one big funnel and the general design of the ship give an impression of good proportion and graceful appearance.

Each of these vessels has four large hatches, measuring: No. 1 hatch, 29-ft. 3-in. by 18-ft.; No. 2 hatch, 35-ft. by 20-ft. 0-in.; No. 3 hatch, 32-ft. 6-in. by 20-ft. 0-in.; and No. 4 hatch, 30-ft. 0-in. by 20-ft. 0-in. They are equipped with 12 electrically driven winches manufactured by Lawrence & Scott of England and 14 cargo derricks, arranged as follows: No. 1 hatch, three 3-ton winches and three 6-ton derricks; No. 2 hatch, four 3-ton winches and two 10-ton and two 3-ton derricks; No. 3 hatch, four 3-ton winches and two 3-ton and three 6-ton derricks; No. 4 hatch, two 3-ton winches and two 6-ton derricks. The windlass and steering gear are electrically driven.

The main engine consists of one set of Burmeister & Wain 4 cycle, single acting, airless injection engine, of six cylinders, 740 m.m. in diameter and 1,500 in stroke, developing 3,000 B.H.P. at 112 r.p.m., the highest speed attained at the trial run being 17.143 knots. The *Sydney Maru* is the third vessel in the world to be equipped with this latest type of Burmeister & Wain engine, the preceding two being Blue Funnel liners. The exhaust from the main engine is led to the thimble tube boiler manufactured by the Clarkson Company of England, mainly for the heating system. The auxiliary equipment of the *Sydney Maru* and her sister ships consists of three each of B. & W. Diesel generators, 100 K.W., airless injection, 4 by 230 by 380, 147 B.H.P. at 390 r.p.m. They are each equipped with two built-up type propellers, 13-ft. 6-in. in diameter.

These liners have three cold storage compartments of 121 tons, 84 tons, and 34 tons, making a total of 239 tons, equipped with two sets of steam driven compressors manufactured by Thomas Ths. Sabroe & Co., Ltd., Aarhus, Denmark.

These liners are designed for the transportation of special cargoes peculiar to this run: wool, silk goods, tallow and live stock such as chicken, sheep and horses. A special device is installed on the after deck for providing the livestock with drinking water.

The maiden trip of the *Sydney Maru* which took place in December last year, was very satisfactory, the average sea speed between Yokohama and Melbourne being 13½ knots. The second ship on the run, the *Melbourne Maru*, which started her maiden trip in April, this year, is also showing excellent operating results.

### The South American Line

The *Buenos Aires Maru* and the *Rio de Janeiro Maru*, the large Sulzer engined ships of the new O.S.K. fleet have been constructed at the Nagasaki Works of the Mitsubishi Shipbuilding and Engineering Co., Ltd. The *Buenos Aires Maru* was commissioned in November, last year, while the *Rio de Janeiro Maru* has just been completed at the same yard and is ready to start her maiden voyage by the beginning of June. The full description of these two vessels appeared in the May issue of the *Far Eastern Review*.



New N.Y.K. 9,816 Tons Motor Liner "Heiyo Maru," for the Orient-South American West Coast Service; Built by the Osaka Iron Works, Ltd.

## N.Y.K. Twin-Screw Motor Liner "Heiyo Maru"

THE *Heiyo Maru* for the Orient-South American West Coast Service of the Nippon Yusen Kaisha has just been completed by the Osaka Iron Works, Ltd., at their Sakurajima Yard, Osaka. The keel was laid down on December 4, 1928, and the ship was launched on October 5, 1929.

The leading particulars of the vessel are as follows:—

Length overall.	482 ft. 1 in.
Length B. P.	460 ft. 0 in.
Breadth moulded.	60 ft. 0 in.
Depth moulded.	40 ft. 6 in.
Gross tonnage.	9,816 tons.

The external features of the vessel include a raked straight round stem, elliptical stern, large superstructure, two pole masts and one funnel, giving the vessel a handsome and graceful appearance.

The ship has in all five decks; the boat, bridge, upper, second, and third deck respectively.

The ship has been constructed and equipped under Teishinsho Special Survey, in accordance with the Shipbuilding Rule, Ship Inspection Law, Ship Load-Line Law, and also with the requirements of the highest class of Lloyd's Registry under their Special Survey—class 100 A1 with Freeboard.

The vessel has a continuous cellular double bottom and is subdivided by seven watertight transverse bulkheads extending to the upper deck, in accordance with the new International Convention so that the ship would remain afloat with any compartment open to the sea.

Above the upper deck, fireproof bulkheads are arranged also in accordance with the requirements of the new Convention, suitably sectionalizing the upper portion of the ship, so that any outbreak of fire could be localized. The constructors has taken exhaustive precautions to minimize the ship's vibration and for the insulation of noise in the engine room.

### Equipment

As the vessel, besides her passenger functions, is designed to carry considerable quantities of cargo in the lower holds and lower 'tween decks, the arrangements for working cargo form an important

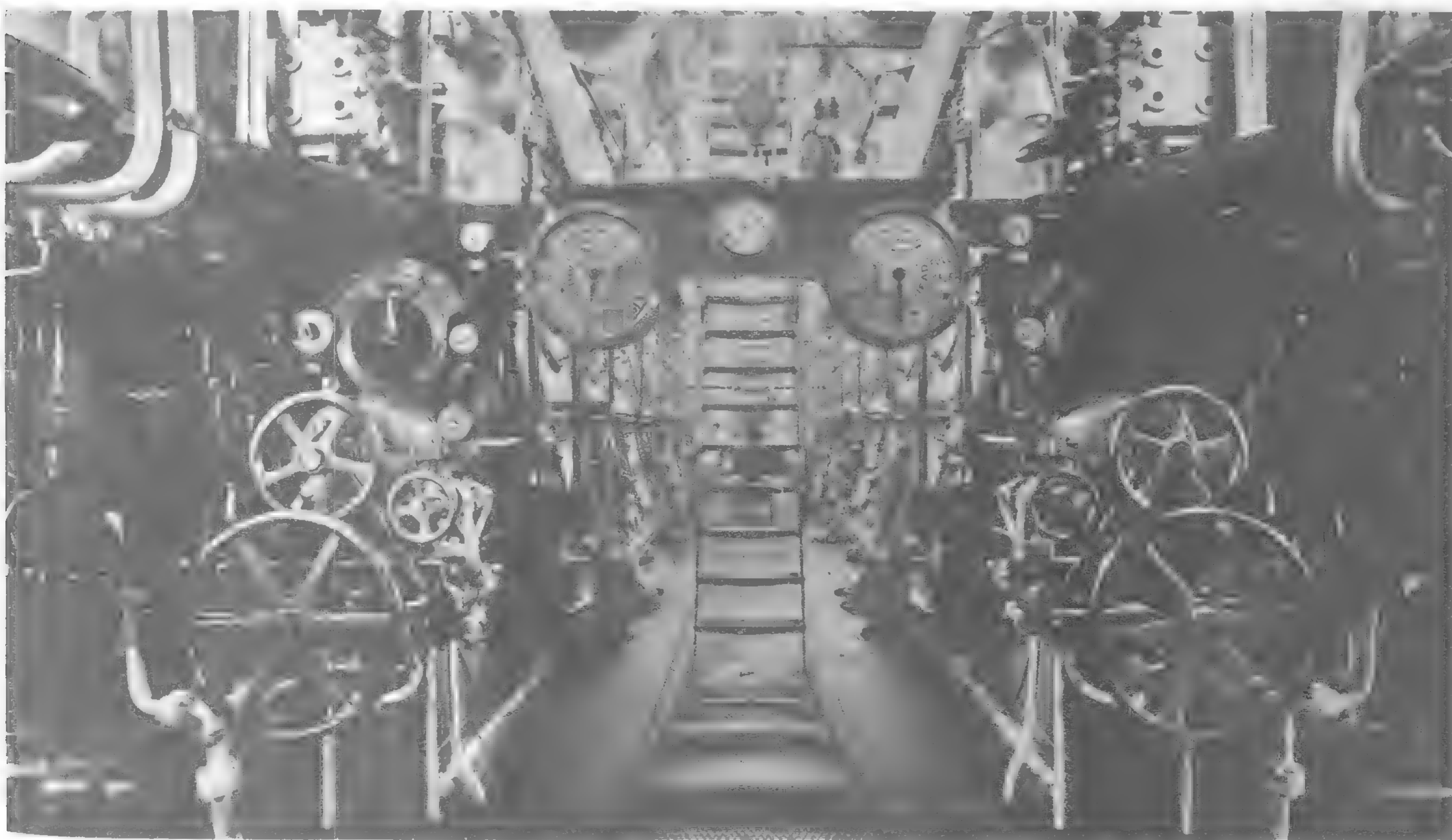
part of her equipment. There are five cargo hatchways giving access to the cargo spaces, and these are served by 17 Mannesmans steel cargo derricks. Of these derricks, three for No. 2 hatchway are capable of lifting 10-ton loads and three each for No. 1 and No. 5 hatchways are capable of lifting six tons, and four for No. 3 hatchway are capable of lifting three tons. For working these derricks, there are provided 17 electric cargo winches manufactured by Messrs. Laurence, Scott & Co. of England. All these winches are the makers' latest standard, worm-gear, electric cargo winches of a silent-running type, eminently suitable for passenger ships, obviating, as they do, the disturbance of passengers. Three out of 17 are capable of lifting a load of five tons at a speed of 130 feet per minute, and the remaining 14 are capable of lifting a load of three tons at a speed of 100 feet per minute, all having very quick speed at light and medium load.

An electric windlass manufactured by Messrs. Clarke, Chapman & Co., Ltd., of England, is arranged on the forecastle deck. The windlass is capable of exerting a pull, at the lifters, of 18 tons at 37 feet per minute, the electric motor being capable of developing 90 B.H.P.

There are also, for warping purposes, two electrically-driven capstans on the forecastle deck forward and two on the upper deck aft, each capable of exerting a pull of 12 tons at 70 feet per minute with motor of 85 B.H.P. One of the capstans arranged on the upper deck aft is also workable for stream anchor cables. All the above capstans have been supplied by Messrs. Napier Brothers, Ltd., Glasgow. A mooring winch of five tons at 130 feet per minute is arranged on the upper deck aft also for mooring purposes with extended shaft.

The steering gear has been supplied by Messrs. John Hastie & Co., Ltd., of Greenock. It is of the electro-hydraulic type in duplicate, each gear consisting of two hydraulic rams and a variable stroke hydraulic pump driven by an electric motor of 35 B.H.P. Control from the navigating bridge is effected by a telemotor of Mactaggart, Scott & Co., Ltd., and the gear is also mechanically controlled from the steering standard on the docking bridge as usual.

The two sets of Seager's multiple effect CO<sub>2</sub> refrigerating machinery to deal with the refrigerated store, have been supplied by



Engine Room of the N.Y.K. Motor Liner "Heiyo Maru;" Equipped with Two 2-Cycle, Single-Acting, Air-Injection Sulzer's Standard Short-Stroke Type, Made by the Mitsubishi Zosen Kaisha, Nagasaki

Messrs. Kobe Steel Works, Ltd., Kobe, Japan, and are placed at the third deck level on the starboard side of the main engine-room. The plant includes two electrically-driven compressor engines and the necessary evaporators, brine pumps and other auxiliaries. The plant has a capacity sufficient to keep the whole cold provision store at the necessary low temperature while making four cwt. of ice per day.

The equipment of Life-saving appliances embodies a number of noteworthy features and conforms to the elaborate requirements of Teishinsho, and the British Board of Trade for passenger and emigrant vessels. Altogether there are 17 boats of various types and sizes having a capacity sufficient to accommodate all the passengers and crew on board. One of the boats is motor-driven, equipped with a Thorneycroft motor, type R.D.4 35 B.H.P., a wireless installation and a searchlight.

The boat-launching appliances have been supplied by Messrs. Welin-Maclachlan Davits, Ltd., and are capable of placing all the lifeboats in the water in a few minutes. There are two sets of gravity-type davits operating a single lifeboat with a capacity for 50 persons each and a motor-boat with a capacity for 34 persons, and six sets of Welin's quadrant davits, which operate a lifeboat with a capacity for 50 as well as a collapsible, decked lifeboat stowed underneath, with a capacity for 61, and two sets of similar type operating a lifeboat only with a capacity for 50 persons. In addition to the above, there is a "Temma" arranged on the aft boat deck under ordinary davits.

There are two sets of boat winches attached to gravity davits working through wire falls and two sets of independent boat-winches arranged on the boat deck house top in order to operate all boats under Welin quadrant davits working through manila falls. Robinson's patent (water-borne) boat-releasing gear is also adopted, in order to prevent unsafe releasing before the boat is completely water-borne.

Especially noteworthy is the elaborate equipment of fire-detecting and extinguishing appliances, these include the Rich-Lux fire-detecting and extinguishing system of Walter Kidde & Co., U.S.A., complete hydrant arrangement and usual hand chemical extinguishers. The Lux CO<sub>2</sub> system as well as hand chemical extinguishers are also installed in the machinery compartments. In the Rich-Lux system, smoke accumulators are fitted in cargo or store compartments, and these are connected by steel tubes to a detector cabinet in the wheel-house, so that an outbreak of fire in any compartment may be soon detected by the officer on watch; then the officer has only to run to the CO<sub>2</sub> valve manifold arranged at a very easily accessible place in the 'tween deck and to open the valve; the compartment is then soon filled with CO<sub>2</sub> gas which extinguishes the fire. CO<sub>2</sub> gas is supplied from bottles arranged in a special compartment near the engine-room.

In other respect every attention has been given to safety appliances throughout the vessel; for instance, the "Scott-Ross" system of watertight doors electrically controlled from the bridge in case of emergency and very complete wireless installation.

The ventilation of the vessel, both natural and mechanical, has received very careful consideration. The mechanical ventilation throughout, including the engine-rooms, is carried out by an installation of fans of various capacity supplied by the Thermotank Co. of Glasgow. The exhaust from certain spaces is also effected by mechanical means, and attention has been given especially to the change of air in the galleys, pantries and lavatories.

Steam radiators have been provided throughout the accommodation for heating purpose.

Among the notable equipments, there are a Sperry's master gyro-compass, steering and bearing repeaters, a continuous course-recorder, Walker's electric log, complete set of Telefunken's Direction Finder, George Kent's clear view screens, Robinson's telegraph, and loud-speaking telephones supplied by Messrs. Siemens Brothers & Co., London, Kelvin's latest motor-driven sounding machines, Helm Indicators, Evershed & Co.'s engine revolution indicators, and "Teledep" pneumatic gauge of Dobbie, McInnes of Glasgow.

### M.V. "Heiyo Maru" Propelling Machinery

The main engines are of the two-cycle, single-acting, air-injection Sulzer's standard short-stroke type made by Messrs. Mitsubishi Zosen Kaisha, Nagasaki, having eight working cylinders develops about 570 indicated horse-power. The mechanical efficiency being 82-83%, the normal aggregate output amounts to 7,500 S.H.P. when running at 115 r.p.m.

Each engine is provided with two injection air compressors, connected at the fore end of the engine with 180° crank angle. The compression is in three stages, the low pressure being double-acting. Should one of the four compressors break down, or give trouble, the rest can supply the necessary air to run the two engines at full power.

The manoeuvring platforms are situated on the floor level at the forward ends of the engines. All necessary handles, indicators, alarm signals, fuel pumps and other important valves are assembled there. The necessary pumps, coolers, turbo-blowers, and the starters for turbo-blowers are arranged on the fore part of this platform for easy manipulation.

The engine in general does not depart from the standard design of Sulzer's 8ST68 short-stroke type, except in certain detailed parts which are improved by the maker. The engine is of the same type as installed for the m.s. *Asama Maru* and *Tatsuta Maru*.

It is to be noted that almost all the main parts of the main engines are home made, and only a few parts, such as vital springs, injection air bottles, compressor valves, telescopic tubes, and cylinder lubricators are made by foreign makers.

Each main engine drives a propeller of four blades, built up type.

### Turbo-Blowers

For the supply of scavenging air to the main engines, two sets of Brown Boveri double suction turbo-blowers, type VMH-1,201, are provided, one acting as a spare. The blowers are directly connected to 380 K.W. electric motors, and each can supply 1,200 cub. metres of air per minute against an absolute pressure of 1.125 kg./cm<sup>2</sup>.

These blowers are installed in a suction chamber, which is constructed on the floor at the forward bulkhead; the air from the boat deck is drawn in by the blowers to this chamber through a vertical common trunk insulated against noise.

The chamber is provided with another suction from the main engine-room, so that the blowers can assist the ventilation of the engine-room and under the floor.

### Circulating System and Auxiliary Pumps

The pistons of the working cylinders of the main engines are cooled by fresh water. Two sets of horizontal, centrifugal, motor-driven pumps of 80 m<sup>3</sup>/H at 4.5 kg./cm<sup>2</sup> are arranged, one being sufficient for the purpose with the other as a spare.

The fresh water delivered by these pumps is cooled by a fresh water cooler of the horizontal condenser type, and the hot returns from the working pistons are collected into an oil-separating tank, which has sufficient capacity for the whole quantity of the circulating fresh water. Two air chambers with an air pipe each and two light non-return valves are fitted on each hot return main pipe to the oil separating tank, so that cooling water circulates satisfactorily even when the ship is pitching. The make-up supply of circulating fresh water is brought by the fresh water pump from the fresh water reserve tank arranged in the double bottom, to this oil-separating tank.

Salt water cooling connections for piston cooling are also arranged for emergency, the hot return to the collecting tank in this case being led to the bilge way and pumped overboard by bilge pumps.

The cylinders, jackets, exhaust gas manifolds, fresh water cooler and oil coolers are cooled by salt water, and for this service two sets of horizontal, centrifugal, motor-driven pumps, made by Mitsubishi Zosenjo at Kobe, are provided. The capacity of each pump is 350 m<sup>3</sup>/H at 25 m. of total head.

For forced lubrication of the main engines, two sets of electrically-driven, Neidig cogwheel precision lubricating oil pumps are provided. Each set comprises one low pressure and one high pressure oil pump mounted on a common bed plate with one D.C. variable speed motor in the centre. The low pressure pump serves through a 4-ton head tank arranged on the bridge deck, for lubricating the bearings and the crosshead guides of the main engines, and is capable of delivering about 50 m<sup>3</sup>/H at 3 atms. The high pressure pump is used only for lubricating the crossheads of the main engines, the capacity being 8 m<sup>3</sup>/H at 18 atms.

The fuel oil used for the main and auxiliary engines is settled and purified. The fuel oil is first settled by heating in the settling tank for about half a day, then pumped up to a 1-ton head tank for fuel oil purifiers by one of the three fuel oil service pumps. The fuel oil purifiers, of De Laval perfect vaportight type No. 900, are fed by gravity from this head tank through a preheater, and

PASSENGER ACCOMMODATIONS OF THE "HEIYO MARU"



First Class Stateroom



First Class Lounge



First Class Dining Saloon



Second Class Lounge



Second Class Smoking Room



Second Class Stateroom

discharge the purified oil to the cleaned oil reserve tank of 10-ton capacity.

The cleaned oil in this tank is then transferred to a 4-ton service tank by another service pump, and thence the oil is led to the main and auxiliary engines through double strainers.

The whole system of oil treatment and supply is kept in constant working condition independently from the load of engines, and for making known the accidental stoppage of the system, the alarm system is adopted.

### Dynamo Engines

For supplying electric power to the various engine-room and deck machinery, lamps, heaters, and other electric apparatus, three main 280 K.W., and one auxiliary 30 K.W., Diesel generators are installed on the sides of the main engines.

The main Diesel generators are built by Messrs. W. H. Allen, Sons & Co., Ltd., at Bedford, England, under licence, on the B. & W. 4-cycle, single-acting, air-injection principle, each having six working cylinders 350 mm. bore by 470 mm. stroke and one three-stage injection air compressor, capable of developing the normal rated output of 420 B.H.P. when running at 300 r.p.m.

The auxiliary generating set is of the Ikegai 4-cycle, single-acting, solid injection engine with 2 cylinders of 220 mm. bore and 340 mm. stroke, capable of developing the normal output of 60 B.H.P. at 350 r.p.m.

The generators coupled to these sets of machinery are all of the direct current, drip-proof, multipolar, compound-wound type based on the British Engineering Standard Specification and constructed for perfect parallel operation. These engines are cooled by salt water, and two Allen's horizontal, centrifugal pumps of 80 tons per hour each are fitted for this service, one of the two standing as a spare. For the purpose of extracting oil vapor in the crank-case of the three Diesel generators, two sets of vapor extractors made by Keith & Blackman Co., Ltd., are installed.

### Compressed Air Plant

Compressed air for starting and reversing the main engines is stored in 12 high-pressure air bottles of 800 litres at 70 atms. and two low pressure air tanks of 16 cub. metres at 32 atms.

For charging these air storage vessels, there are fitted one Mitsubishi-Sulzer 3-stage air compressor 4C36 driven by a D.C. variable speed motor. This has sufficient capacity for supplying the injection air to the main engine, when one set of the main compressors breaks down.

For the first charge of the starting air bottle of the main Diesel generator, one motor-driven emergency air compressor of the Sulzer's pattern 1C-11 is installed, electric power being supplied by a 27 K.W. emergency generator on the house top.

### Steam Plant

On the third deck at forward part of the engine-room, there is boiler compartment containing two boilers; one a single-ended Scotch type 8-ft. 6-in. long and 8-ft. 6-in. in diameter, and one the Cochran type 4-ft. 9-in. dia. and 12 feet high, constructed in compliance with the Teishinsho, Lloyd's and American Rules for working pressure of 100 lbs./sq. in., having 600 and 200 square feet heating surface respectively for raising the steam necessary for galleys, room heating, laundries, steam-driven pumps, whistles, calorifiers, oil settling and other purposes. The feed pumps, condensers, burning unit, evaporator, feed heater and other tanks are arranged in the same compartment.

### Ventilation

For ventilation of the engine-room, five sets of ordnance fans driven by 8.5 H.P. variable speed motors are arranged. As for the trunking, special attention has been paid to prevent the accumulation of combustible oil vapor under the engine-room floor.

### Oil Pumps

Two fuel oil transfer pumps of Neidig precision cogwheel type are arranged in the forward port wing, the capacity of each being 100 cubic metres per hour at a pressure of 2.1 atms.

As already described, there are three fuel oil service pumps, also of Neidig precision motor-driven, horizontal, cogwheel type, capable of delivering 15 tons per hour.

One 6.5-ton capacity lubricating oil shifting pump of cogwheel type is provided, chiefly for the service of pumping up lubricating oil from the drain tanks to the renovating tank, and also to the head tank for purifiers.

### Pumps for Ship's Use

There are ten sets of ship's use pumps arranged at the wings of the engine-room. These pumps are all of the Drysdale, upright, centrifugal type. The following is a brief description thereof.

One bilge pump with a capacity of 130 tons per hour, driven by 29 H.P. electric motor, is arranged in the starboard wing. The pump is fitted with an air exhauster.

One submersible emergency bilge pump with a capacity of 130 tons per hour, driven by a 25 H.P. electric motor, is arranged in the starboard wing. The motor is connected with an emergency electric circuit as well as main circuit. The starter is fitted in the emergency generator room, and the suction and delivery valves of the pump are controlled from the upper deck.

It is to be noted that a bilge water separator having a capacity of 60 tons per hour, made by the Stream Line Filter Co., is fitted on the third deck, for keeping the discharged bilge water free from oil and for diminishing the oil wasted.

One ballast pump with a capacity of 200 tons per hour is arranged on the starboard wing, driven by a 27 H.P. electric motor.

One fire and wash-deck pump is installed on the port wing, driven by a 29 H.P. electric motor, the capacity being 65 tons against a head of 230 feet when used as fire pump and 100 tons against a head of 80 feet when used as a wash-deck pump.

One general service pump having a capacity of 70 tons per hour, is fitted in the port wing, driven by a 29 H.P. electric motor. The capacity is reduced to 45 tons against a head of 230 feet when used as a fire pump.

There are two sea water sanitary pumps, one of 70 tons' capacity used for cold sanitary service, the other of 20 tons' capacity used for hot water service. The hot discharge of the main and auxiliary engine cooling is utilized for hot water service by the latter pump.

Two 30-ton fresh water service pumps are arranged in the starboard wing, each driven by a 10 H.P. electric motor.

### Oster-Williams Announces New Four-Inch Reamer

Plumbers and pipe-fitters who have spent hours reaming out four-inch and other large size pipe with a hand file in the absence of a large power machine, will welcome the new No. 414 Reamer recently placed on the market by the Oster Manufacturing Company of Cleveland, Ohio.

A feature of this new Reamer is the screw feed, the pitch of which is so designed that tremendous pressure is exerted by the reaming blades. This feature eliminates entirely the necessity for pushing against the tool to obtain sufficient pressure for a thorough reaming job.

The No. 414 Reamer was designed primarily to be used with the Oster No. 414 Power Boy, but provision has been made so that two additional handles may be used for hand operation.

There are three reaming blades, so designed that they can be replaced if necessary. The body of the tool is made of certified malleable iron. The No. 414 is the only Reamer of its type on the market. It is fully guaranteed against breakage.

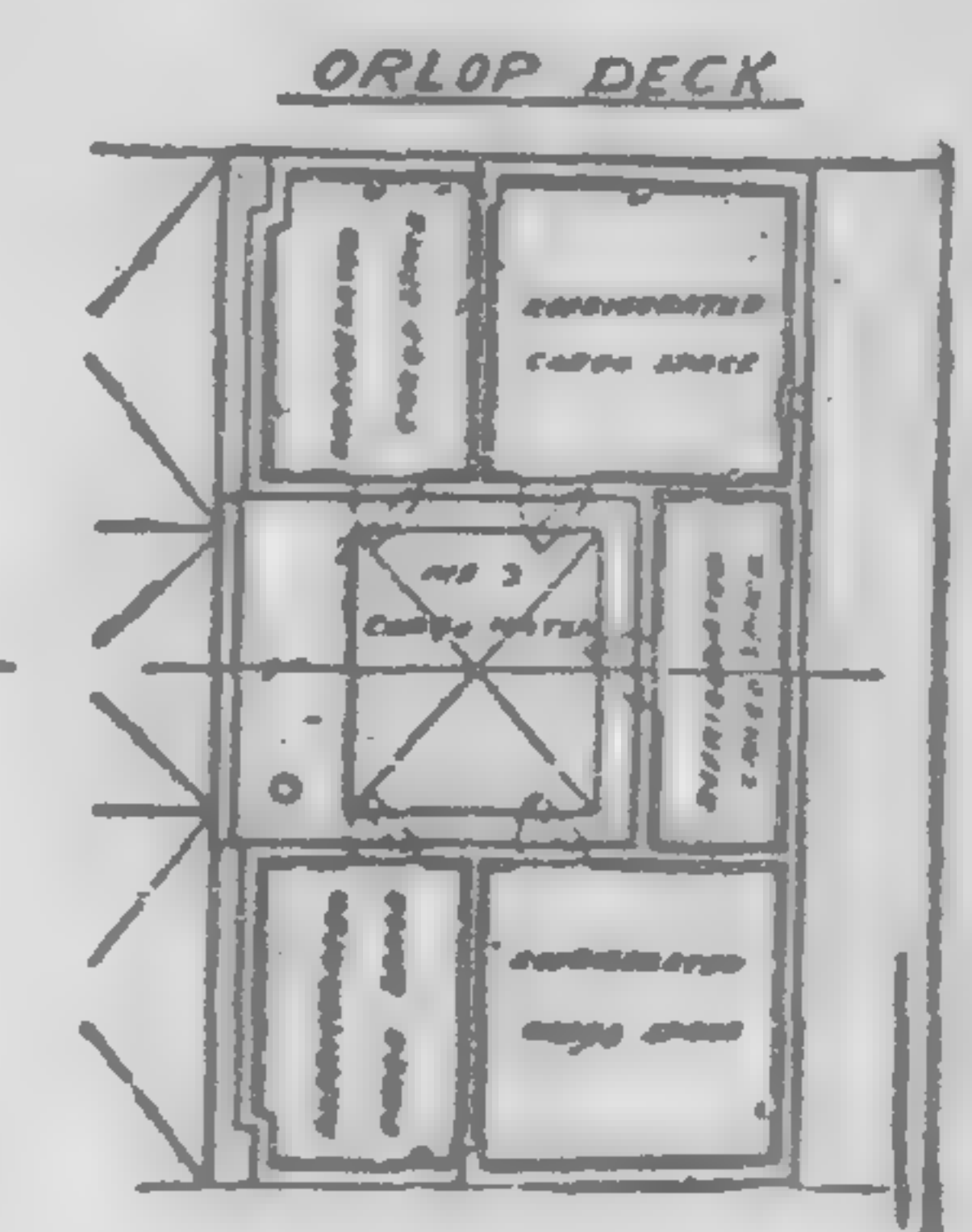
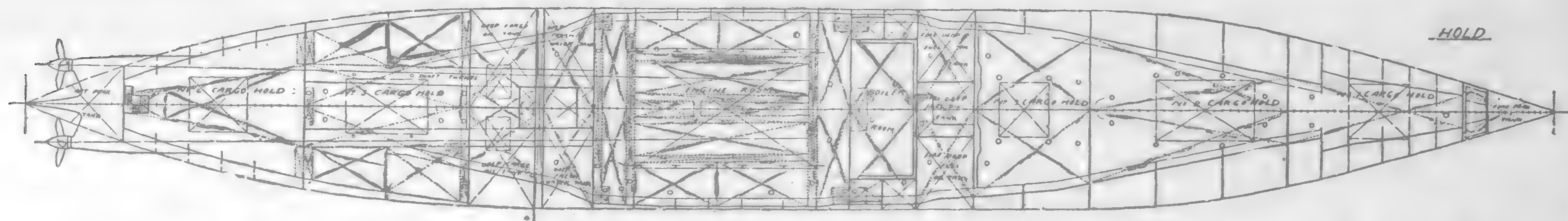
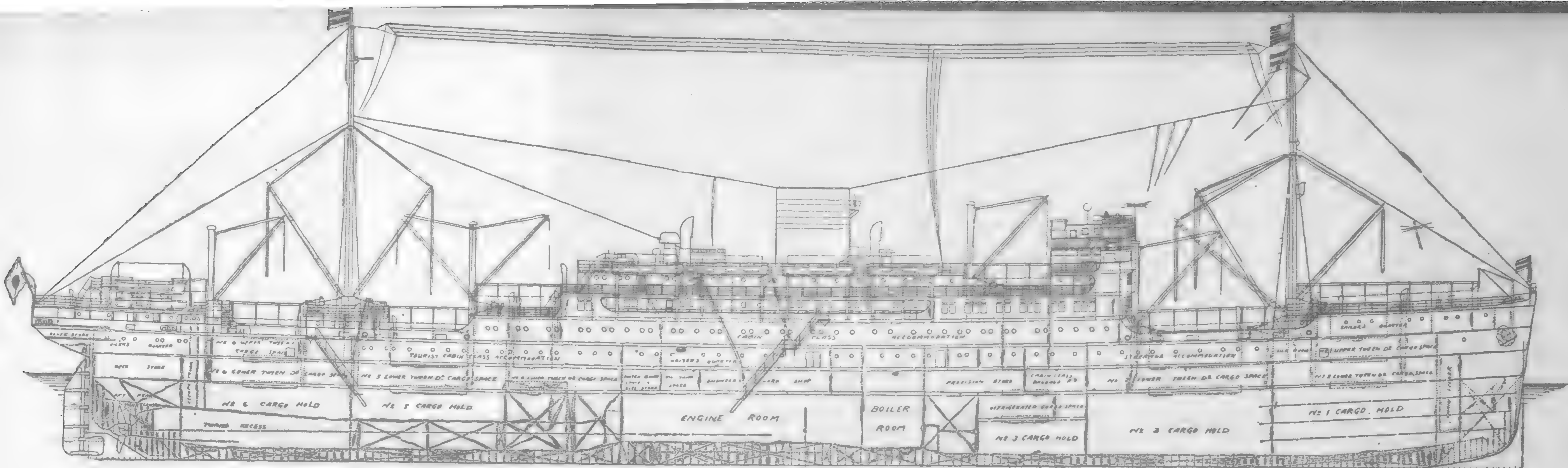
### William Designs New "Superrench" For Water-Pump Adjustment

To facilitate water-pump adjustment, the J. M. Williams & Co. of Buffalo, New York, have recently designed a new "Superrench" that is especially adapted to this work.

The Water-Pump "Superrench" has thin jaws, narrow head and a twelve-point opening. It is drop-forged from Chrome-Molybdenum steel, heated and Chrome-plated with head polished bright. Like all "Superrenches," it is guaranteed against breakage.

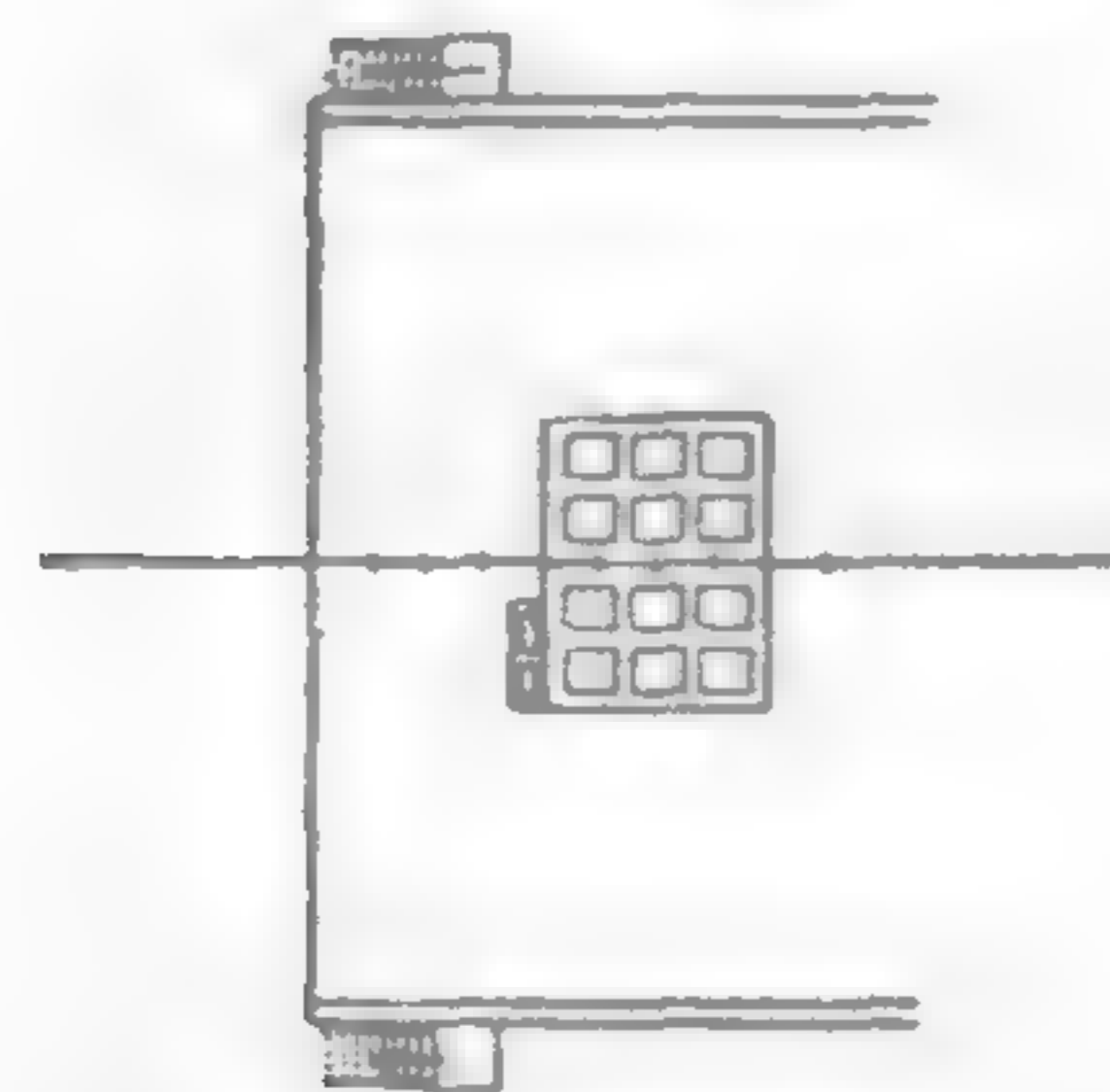
Mechanics who service hard-to-get-at water-pumps in many of the new cars and who have experienced the difficulty of handling the packing gland-nut with tools not designed for the purpose, have received this new "Superrench" with enthusiasm.

Prices and specifications of the new Water-Pump "Superrench" are available from the manufacturers on request.

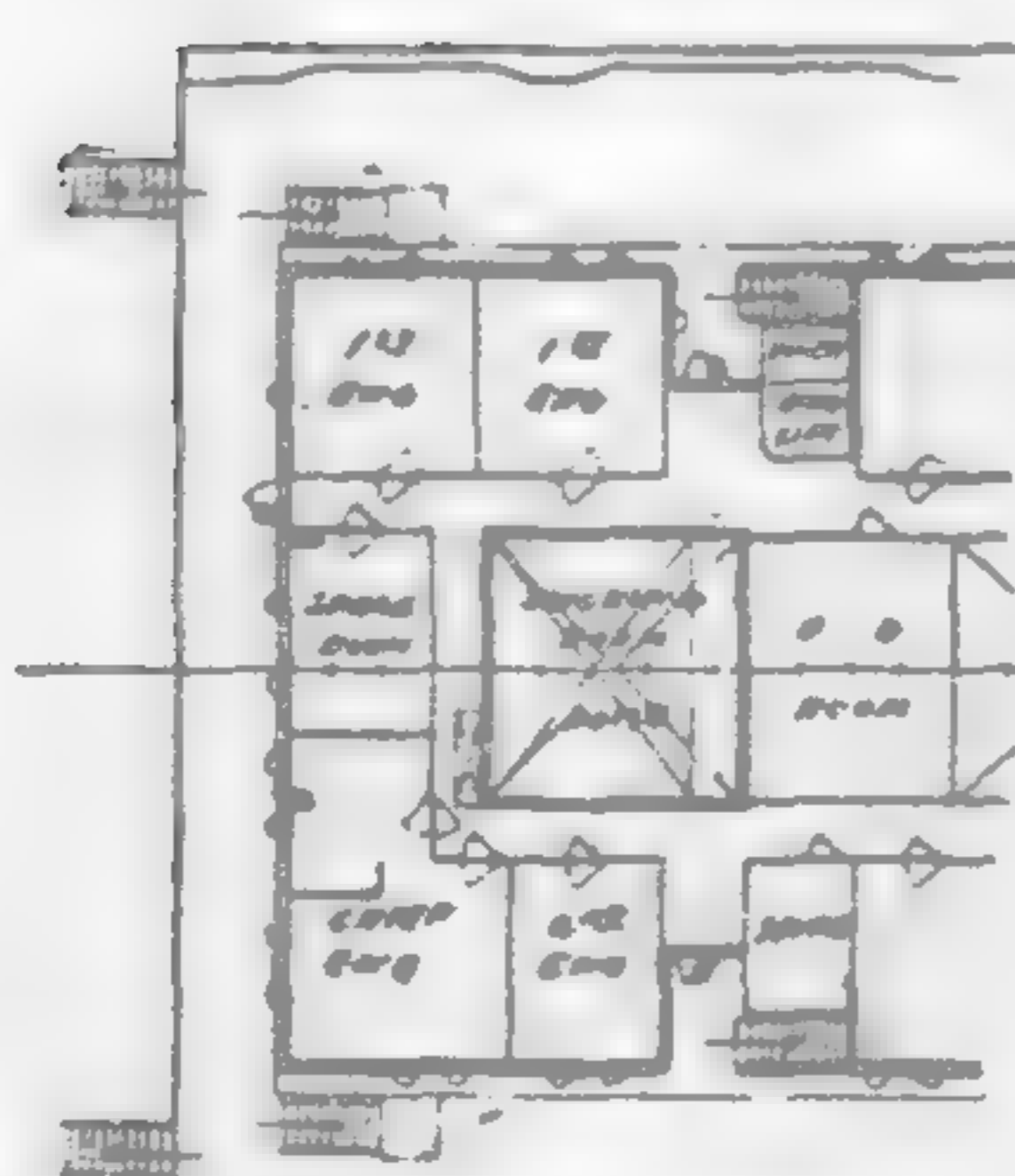


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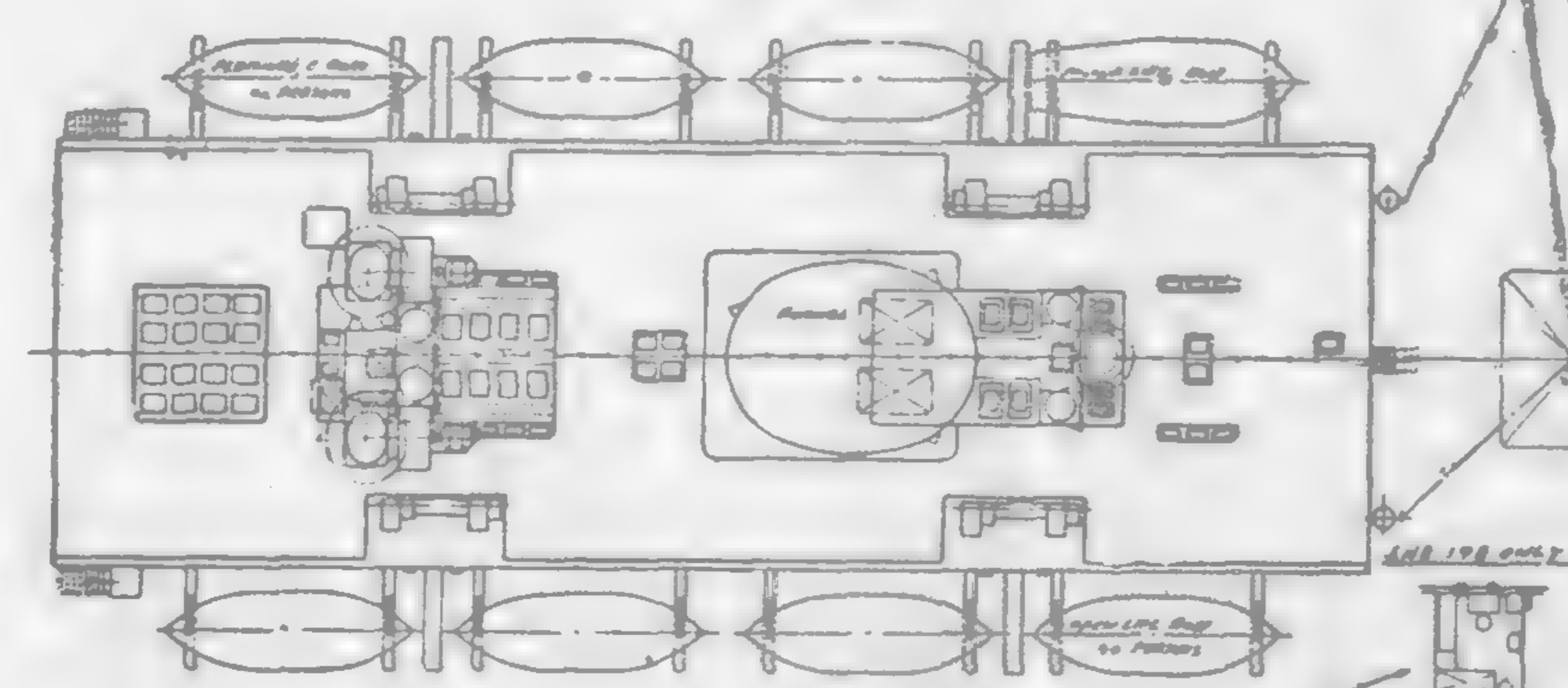
NO 6 CARGO HOLD.



NO 5 CARGO HOLD.



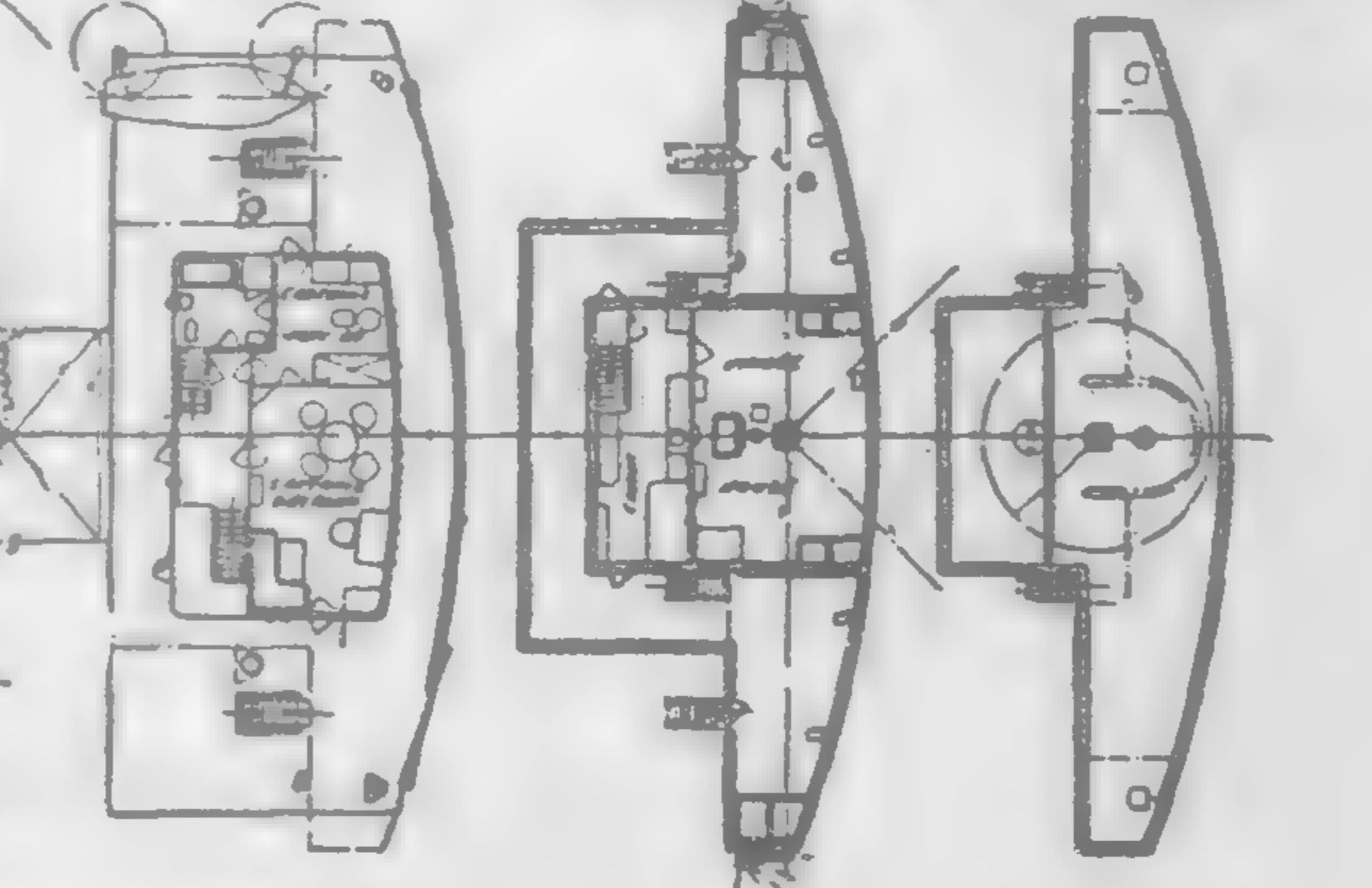
BOAT DECK HOUSE TOP.



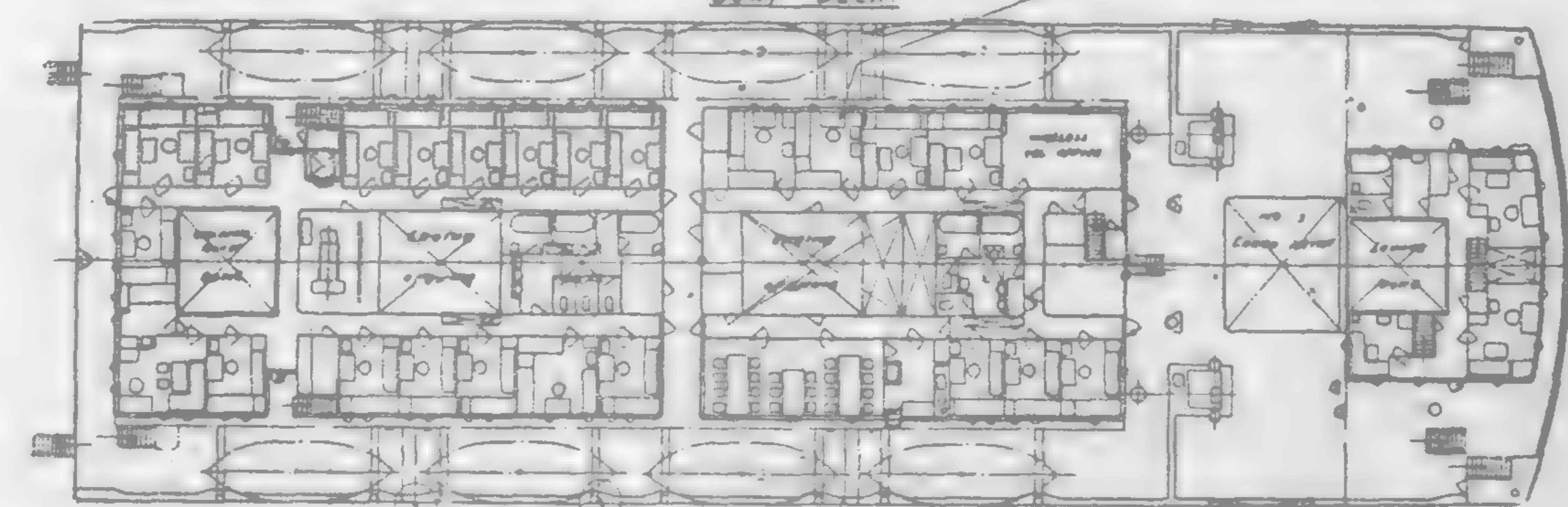
CAPTAIN'S BRIDGE.

NAVIGATION BRIDGE.

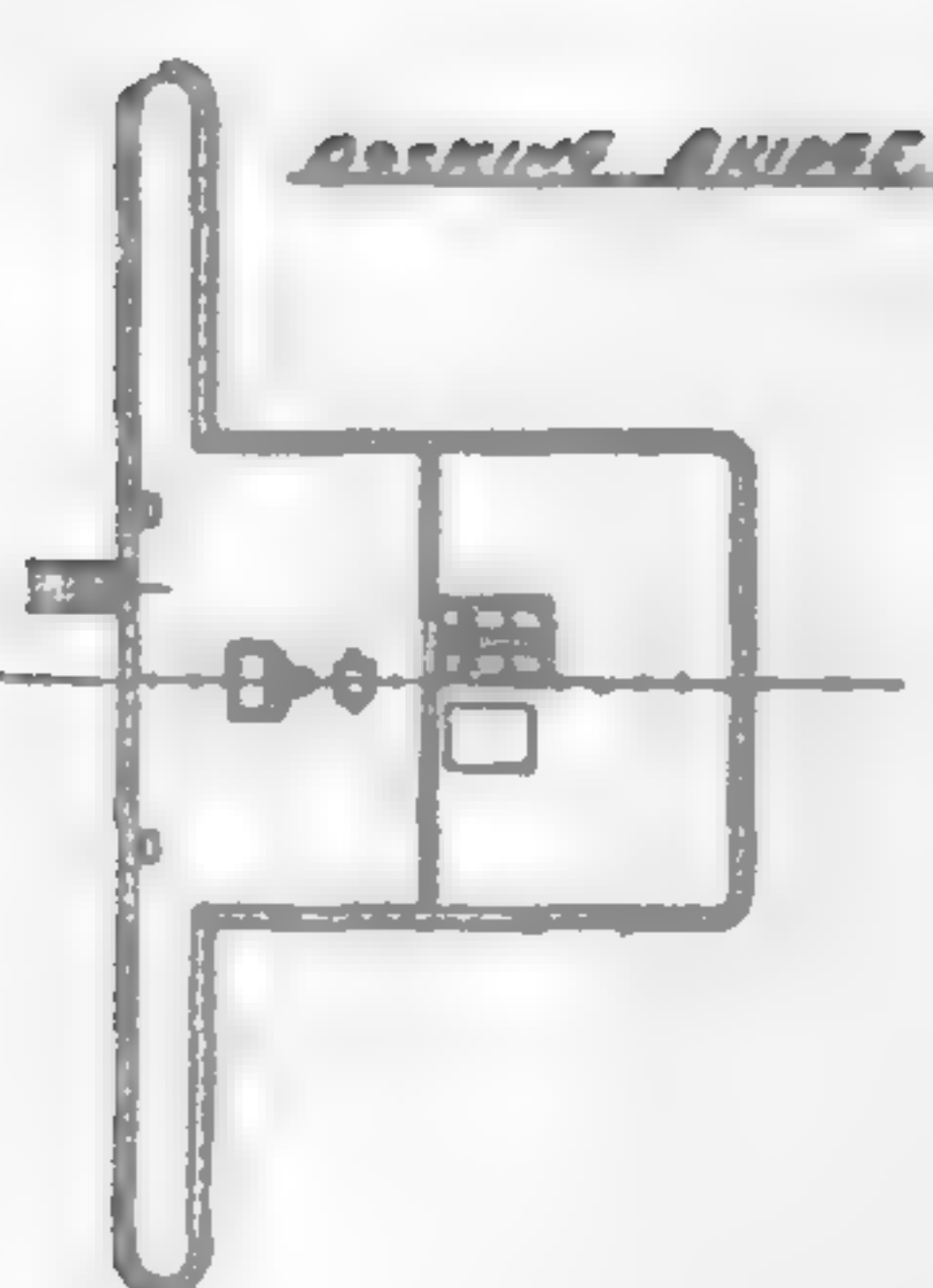
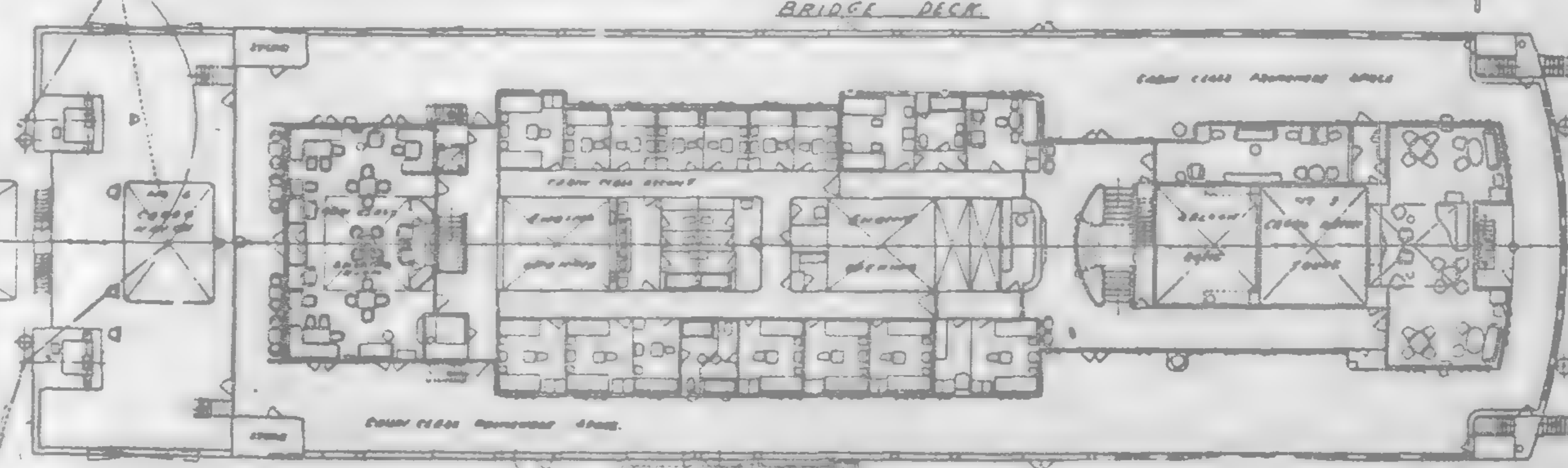
COMPASS BRIDGE.



BOAT DECK.

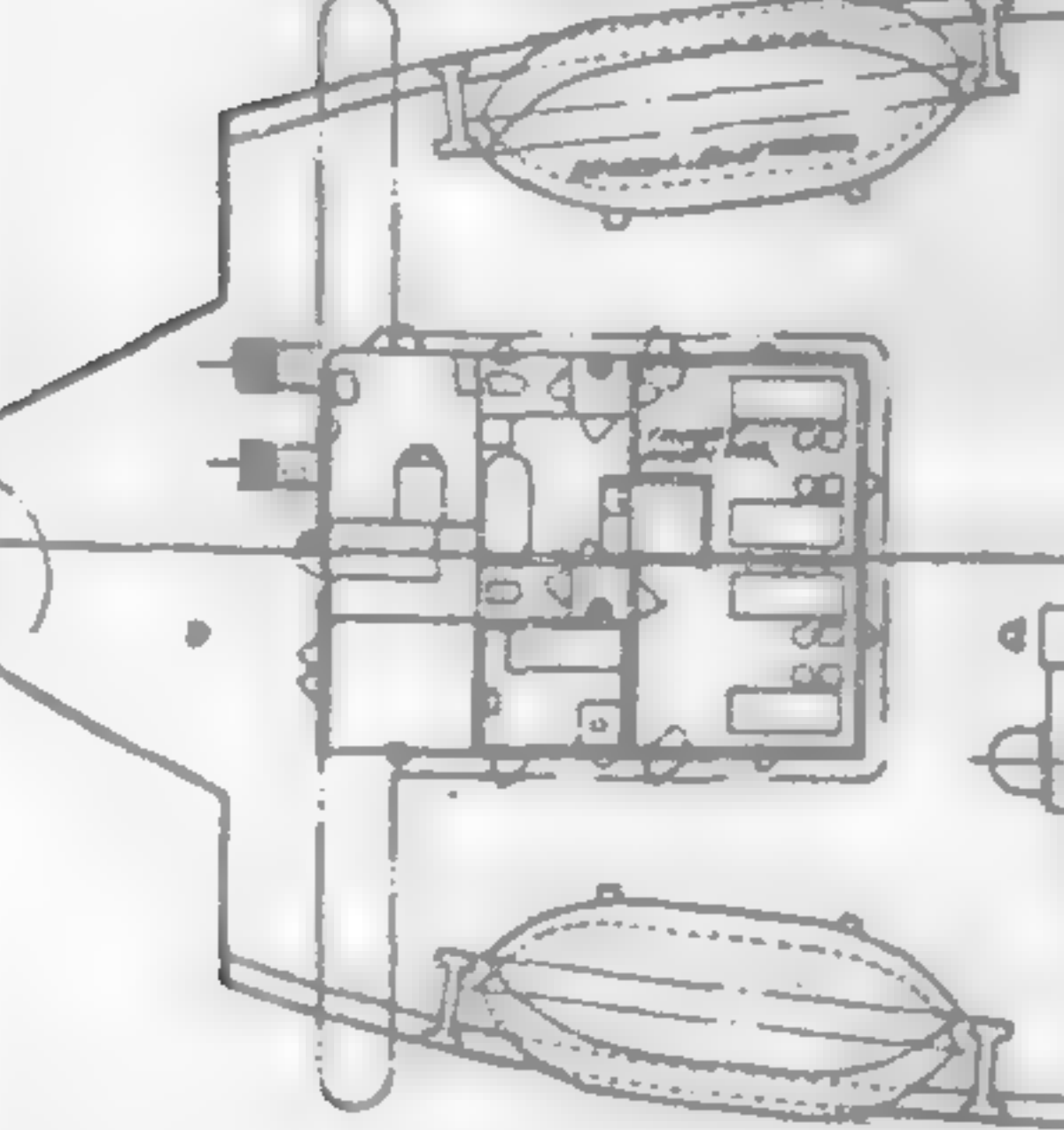


BRIDGE DECK.

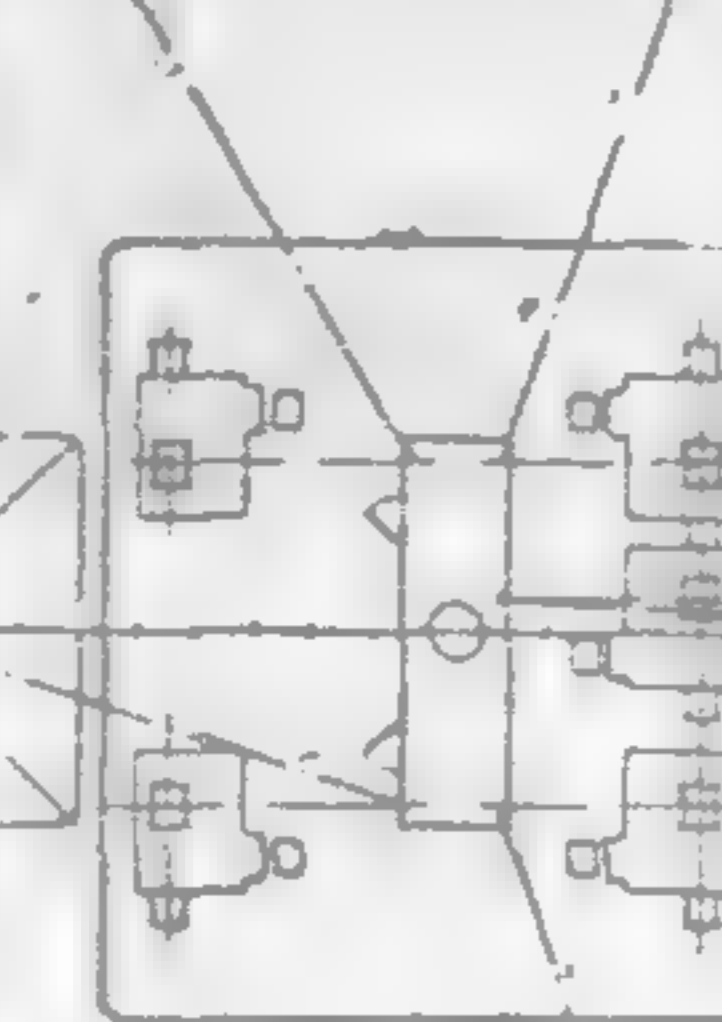


ROCKETING BRIDGE.

AFT BOAT DECK.

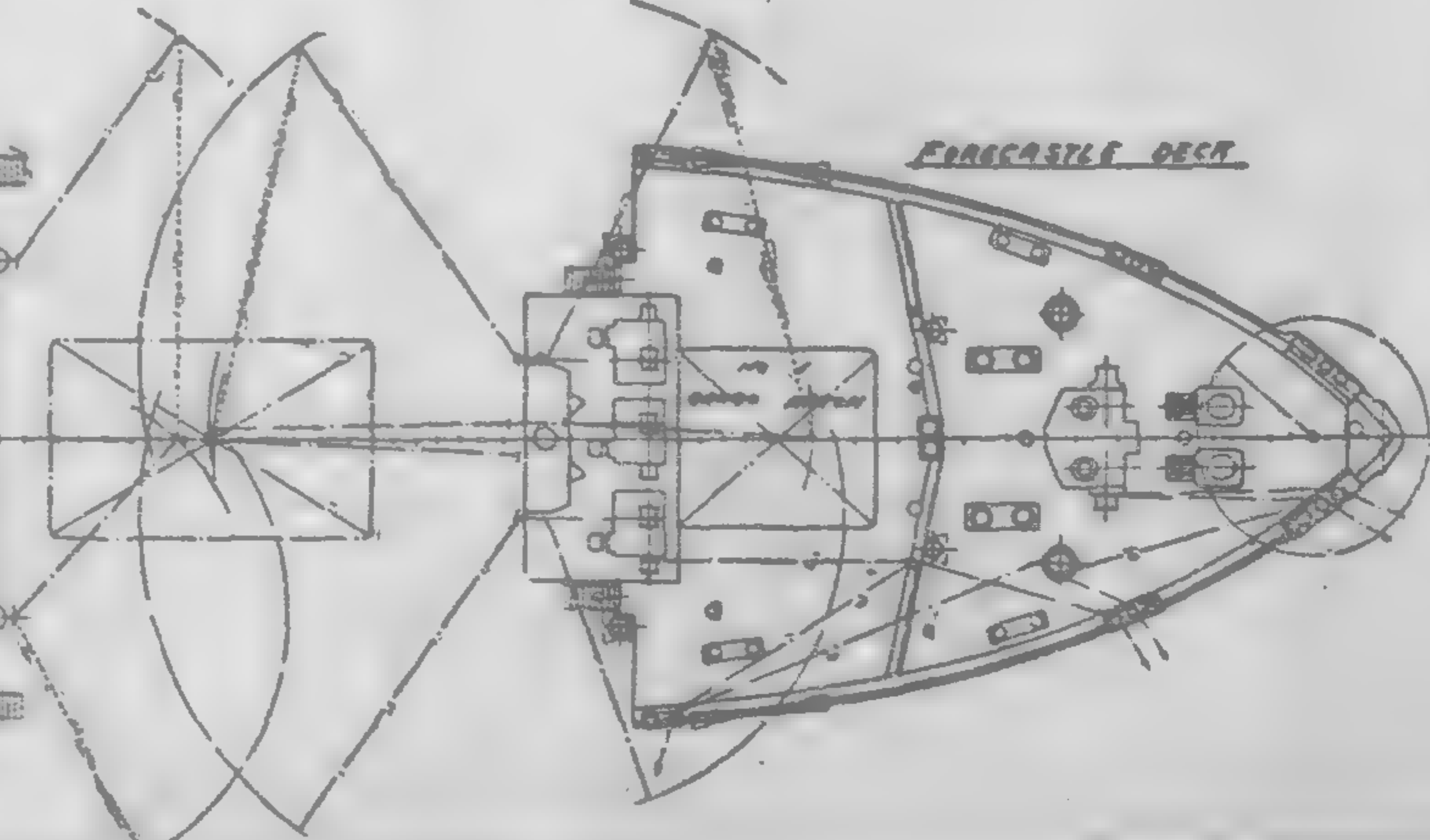


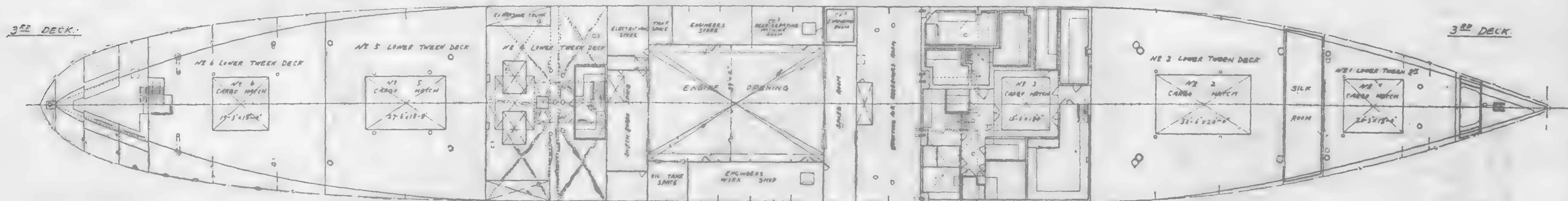
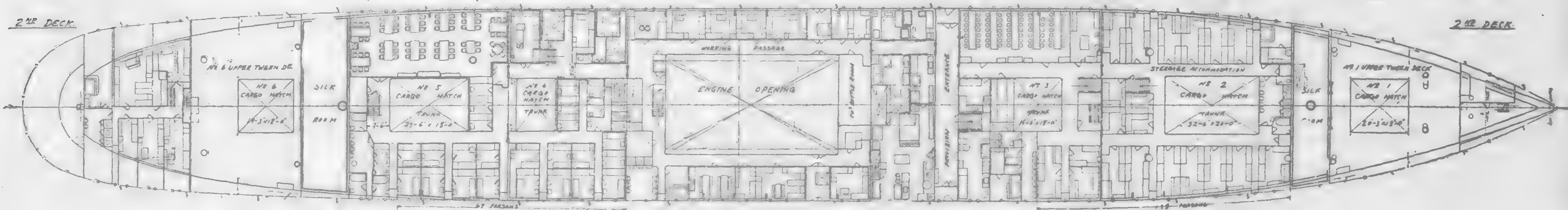
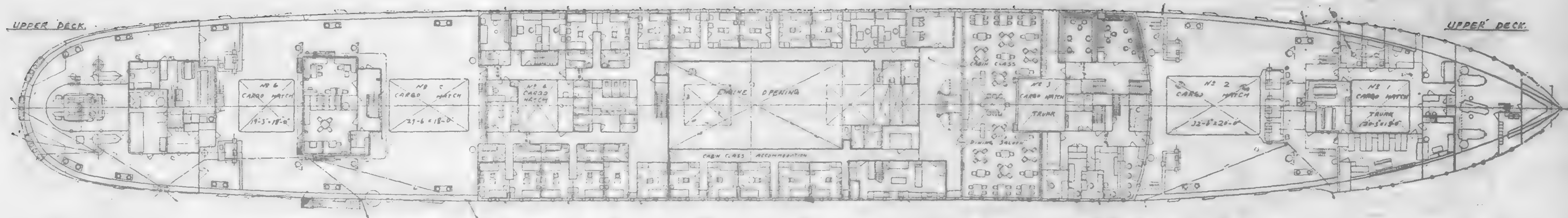
WHEEL PLATFORM.

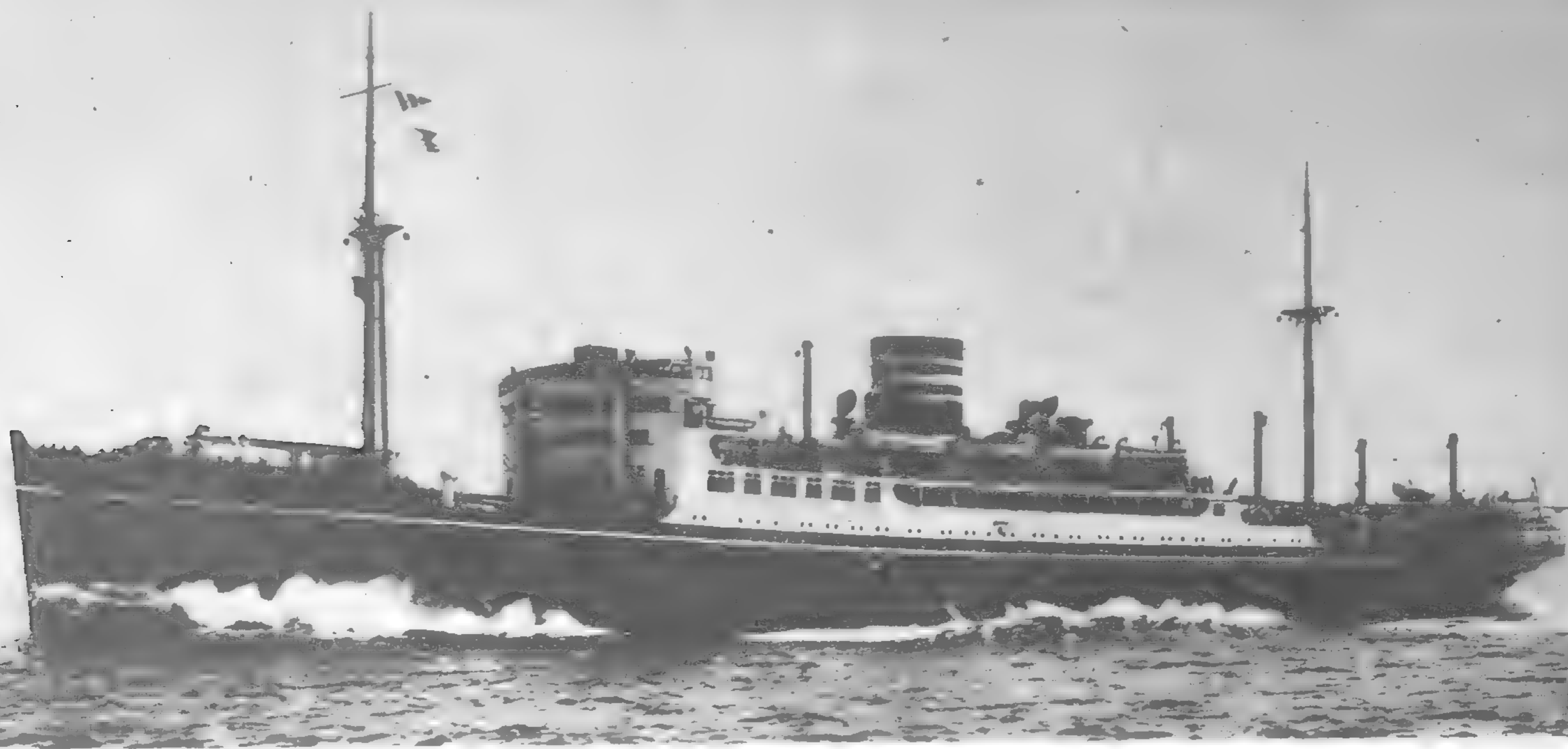


Deck Plans  
of the  
"Hikawa Maru,"  
"Hiye Maru"  
and  
"Heian Maru"

FIRECASTLE DECK.







N.Y.K. 11,600 Ton New Motorship "Hikawa Maru" for the Orient-Seattle Service, Built by the Yokohama Dockyard Co., Ltd.

## New Cabin Motor Ships

M.S. "Hikawa Maru," M.S. "Hiye Maru," M.S. "Heian Maru"

For the N.Y.K. Orient-Seattle Service

THE inauguration of the N.Y.K. Orient-Seattle Service in the last decade of the 19th Century has an historic significance, not only for the Company, but for the port of Seattle. The N.Y.K. has played an important part in the growth and development of Seattle as a sea port. The *Miike Maru* of the N.Y.K. Line, entered the port on August 31, 1896, and gained for the Company the honor of being the first steamship line to open a direct service between Seattle and the Far East. The occasion was celebrated with great rejoicing by the officials and people of Seattle, and is still fresh in the memory of the old residents of that port.

Ever since inaugurating this service, the N.Y.K., stimulated by the prestige and responsibility of being the pioneer steamship line on the route, has endeavored to improve its fleet and service to merit the good-will of the travelling public.

It is now building three new motor ships for exclusive use on this route, and has arranged to transfer the *Korea Maru* and the *Siberia Maru* to the northern Pacific route from its Orient-California Service. This shift is made possible by the commission of the three new super

passenger motor ships on the latter service; the *Asama Maru*, the *Chichibu Maru* and the *Tatsuta Maru*.

The placing of the popular *Korea* and *Siberia Maru*, each of 12,000 tons gross, and the commission of three new motor ships on the route, ushers in a new era in the N.Y.K. Seattle Service.

The *Hikawa Maru*, first of the three modern passenger motorships for this run, was ordered from the Yokohama Dock Company, its construction being started on November 9, 1928, and the launching taking place on September 30, 1929. She sailed on her maiden voyage for Seattle via Victoria on May 14 from Kobe,

Two sister ships of the *Hikawa Maru*, the *Hiye Maru* and the *Heian Maru*, are being equipped, the former at the Yokohama Dock Co., and the latter at the Osaka Iron Works, Ltd., and will be ready for their maiden voyages in August and December of this year.

The leading particulars of each vessel are as follows:—  
Length overall, 535 ft. 11 in.; length B. P., 510 ft. 0 in.; breadth moulded, 66 ft. 0 in.; depth moulded, 41 ft. 0 in.; gross tonnage, 11,600 tons.

The external features include a raked straight round



Launch of the New N.Y.K. Motorship "Heian Maru" at the Yards of the Osaka Iron Works

## CABIN CLASS ACCOMMODATION ON NEW N.Y.K. SEATTLE LINERS



Bed Room



Suite De Luxe

Sitting Room

stem, elliptical stern, large superstructure, two pole masts and one large funnel, giving her a handsome and graceful appearance.

Each ship has five decks designated the boat, bridge, upper, second and third deck respectively. These vessels have been constructed and equipped under Teishinsho Special Survey, in accordance with the Shipbuilding Rule, Ship Inspection Law, Ship Load-Line Law, and also with the requirements of the highest class of Lloyd's Registry under their Special Survey—class 100 A1 with Freeboard.

In accordance with the new International Convention, each vessel has a continuous cellular double bottom and is subdivided by nine watertight transverse bulkheads extending to the upper deck, and so arranged, that the ship will remain afloat with any compartment open to the sea. Above the upper deck, fireproof bulkheads are arranged, suitably section-alizing the upper portion of the ship so that any outbreak of fire can be localized.

The constructors have taken every precaution to minimize the ship's vibration, and for the insulation of noise



Lounge

in engine-room, as well as for the passengers' comfort to be derived from the most luxurious passenger accommodation.

## Equipment

There are six cargo hatchways served by 19 Mannesmans steel cargo derricks and one heavy derrick. Three each of these derricks for No. 2 and No. 5 hatchways are capable of lifting 10-ton loads, three for No. 1 and two for No. 6 are capable of lifting 6-tons, and the remaining eight derricks are capable of lifting 3-tons, the heavy derrick having a capacity of lifting loads up to 30-tons. These derricks are operated by 19 electric cargo winches manufactured by Messrs. Laurence, Scott & Co. of England. All these winches are the makers' latest standard, worm-gear, electric cargo winches of a silent running type, eminently suitable for passenger ships, obviating, as they do, the disturbance to passengers. Eleven out of 19 are capable of lifting a load of 5-tons at a speed of 130 feet per minute, and the remaining eight are capable of lifting a load of



Reading and Writing Room



Dining Saloon



"Hikawa Maru": Tourist Cabin Dining Saloon



Smoking Room

3-tons at a speed of 100 feet per minute, all having very quick speed at light and medium load.

An electric windlass manufactured by Messrs. Clarke, Chapman & Co., Ltd., of England arranged on the forecastle deck is capable of exerting a pull, of 24-tons at 32 feet per minute with a motor capable of developing 116 B.H.P.

There are also, for warping purposes, two electrically driven capstans on the forecastle deck and two on the upper deck aft, each capable of exerting a pull of 15-tons at 100 feet per minute with a motor of 135 B.H.P. All the above capstans have been supplied by Messrs. Napier Brothers, Ltd., Glasgow.

The steering gear has been supplied by Messrs. John Hastie & Co., Ltd., of Greenock. It is of the electro-hydraulic type in duplicate, each gear consisting of two hydraulic rams and a variable-stroke hydraulic pump driven by an electric motor of 45 B.H.P. Control from the navigating bridge is effected by a telemotor of Mactaggart, Scott & Co., Ltd., and also by Sperry's single-unit gyro pilot. The gear is also mechanically controlled from the steering standard on the docking bridge as usual.

Two sets of Sabroe CO<sub>2</sub> refrigerating machinery to deal with the refrigerated cargo and cold storage, have been supplied by Messrs. Thomas Ths. Sabroe & Co., Ltd., Aarhus, Denmark.

The insulated cargo spaces are divided into five compartments. Provision is made to keep each individual compartment respectively at the various desired temperatures, and the plant is capable of keeping the whole of the refrigerated cargo spaces as low as 15° F., while the whole cold provision store is kept at the necessary low temperature and 3 cwt. of ice is made every day.

The Life-Saving appliances embodies a number of noteworthy features. Altogether there are 13 boats of various types and sizes having a capacity sufficient to accommodate all passengers and

crew on board. One of the boats is motor-driven, equipped with a Parsons motor, 28/32 B.H.P. for the *Hikawa* and *Hiye* and a Thornycroft 25 B.H.P. for the *Heian*, a wireless installation and a searchlight, and another two of the boats are equipped with Fleming's manual propelling gear, by which even lady passengers can propel the boat, by merely reciprocating the levers which rotate the propeller through the propeller shaft.

The boat-launching appliances have been supplied by Messrs. Welin-Maclachlan Davits, Ltd., and are capable of placing all the lifeboats in the water in a few minutes. There are eight sets of gravity-type davits operating single lifeboats with a capacity for 40 persons each, and two sets of Welin's quadrant davits, which operate a lifeboat with a capacity for 40, as well as a collapsible, decked lifeboat stowed underneath, with a capacity for 56. In addition to the above, there are one lifeboat and a "Temma" arranged on the Captain's deck under ordinary davits.

There are eight sets of boat winches attached to gravity davits dealing with boats through wire falls ensuring rapid and reliable lowering of the lifeboats to the water. Robinson's patent (water-borne) boat-releasing gear is also adopted, in order to prevent unsafe releasing before the boat is completely waterborne.

Especially noteworthy is the elaborate equipment of fire-detecting and extinguishing appliances. These include the Rich-Lux fire-detecting and extinguishing system of Walter Kidde & Co., U.S.A., automatic fire alarm, complete hydrant arrangement and the usual hand chemical extinguishers. The Lux CO<sub>2</sub> system as well as hand chemical extinguishers are installed in the machinery compartments. In the Rich-Lux system, smoke accumulators are fitted in cargo or store compartments, and these are connected by steel tubes to a detector cabinet in the wheel-house, so that an outbreak of fire in any compartment may be soon detected by the



"Hikawa Maru": Steerage Dining Room



Lounge: Tourist Cabin

officer on watch ; then the officer has only to run to the  $\text{Co}_2$  valve manifold arranged at a very easily accessible place in the 'tween deck and to open the valve ; the compartment is then soon filled with  $\text{Co}_2$  gas which extinguishes the fire.  $\text{Co}_2$  gas is supplied from bottles arranged in a special compartment near the engine-room.

An automatic, electric fire alarm system has been installed to protect all public rooms, staterooms, officers' cabins and crew's quarters. One or more sentinel thermostats are fitted in each compartment, and the whole sentinel thermostats are grouped into a number of convenient circuits to facilitate discovery of the sentinel affected, should the alarm in the wheel-house ring, an alarm gong having been fitted in both wheel-house and engine-room.

In other respects every attention has been given to safety appliances throughout the vessel ; for instance, Stone's system of watertight doors hydraulically controlled from the bridge for the *Hikawa* and *Hiye* and the "Scott-Ross" system of watertight doors electrically controlled from the bridge for the *Heian* both in case of emergency ; very complete wireless installation and searchlights on top of the navigation bridge, etc.

The ventilation of the vessel, both natural and mechanical, has received very careful consideration. The mechanical ventilation throughout, including the engine-rooms, is carried out by an installation of fans of various capacity supplied by the Thermotank Co. of Glasgow. The patent "Punkah Louvre" system has been adopted for supplying air to all the passenger accommodation and crew's quarters amidships. The exhaust from the rooms is also effected by mechanical means, and attention has been given especially to the change of air in the galleys, pantries and lavatories.

Thermotank hot air trunkings are provided in parallel use with electric heaters or steam radiators for heating all the cabin class public rooms, the individual cabin class and tourist cabin staterooms, electric radiators being supplied by Messrs. Naigai Dennetsu Kaisha. Steam radiators have been provided throughout the crew's quarters and also in the passage ways in the cabin class and tourist cabin accommodation and in the public rooms of the steerage.

Among the notable equipments, there are a

Sperry master gyro-compass MNVIII, steering and bearing repeaters, a Sperry continuous course recorder and a Sperry single-unit gyro-pilot for automatic steering, the hydro-electric "Sal" log, a combined speed-indicator and distance-recorder working in parallel with Walker's electric log, complete set of Telefunken's Direction Finder, George Kent's clear view screens, Robinson's telegraph and loud-speaking telephones supplied by Messrs. Gelap, Kelvin's latest motor-driven sounding machines, Sperry's Helm Indicators, Evershed & Co.'s engine revolution indicators, and "Teledep" pneumatic gauge of Dobbie, McInnes of Glasgow.

### Engine-Room

The engine-room is situated at about the middle part of the ship, with the donkey-boiler-room annexed forward of it, communicated with a watertight communication door.

Two main engines are placed side by side at the middle and the Diesel generators and air compressors are arranged in both wings, fuel pumps in the port wing forward, ship's pumps in the starboard wing forward, lubricating and cooling pumps in the after part of the engine-room.

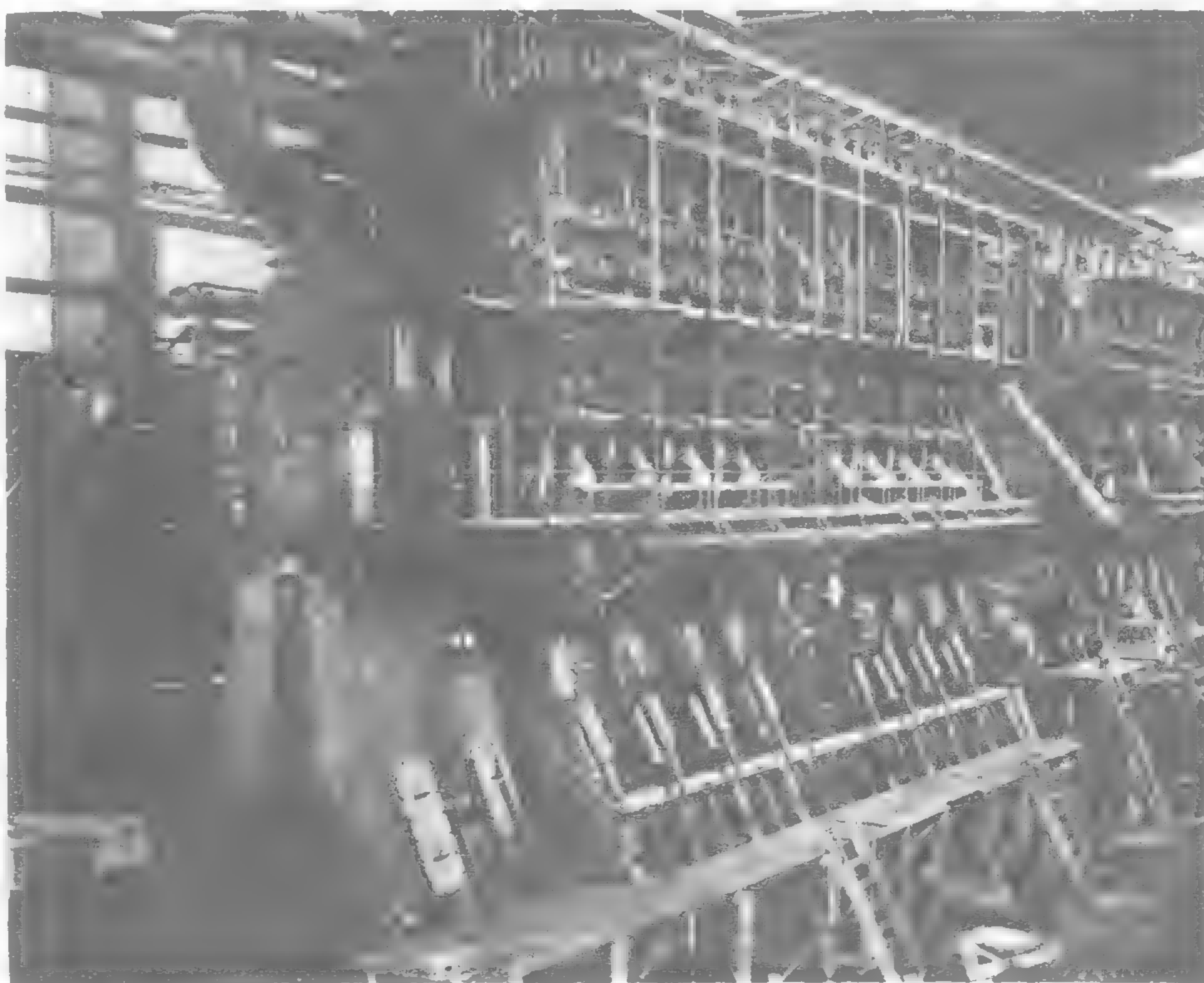
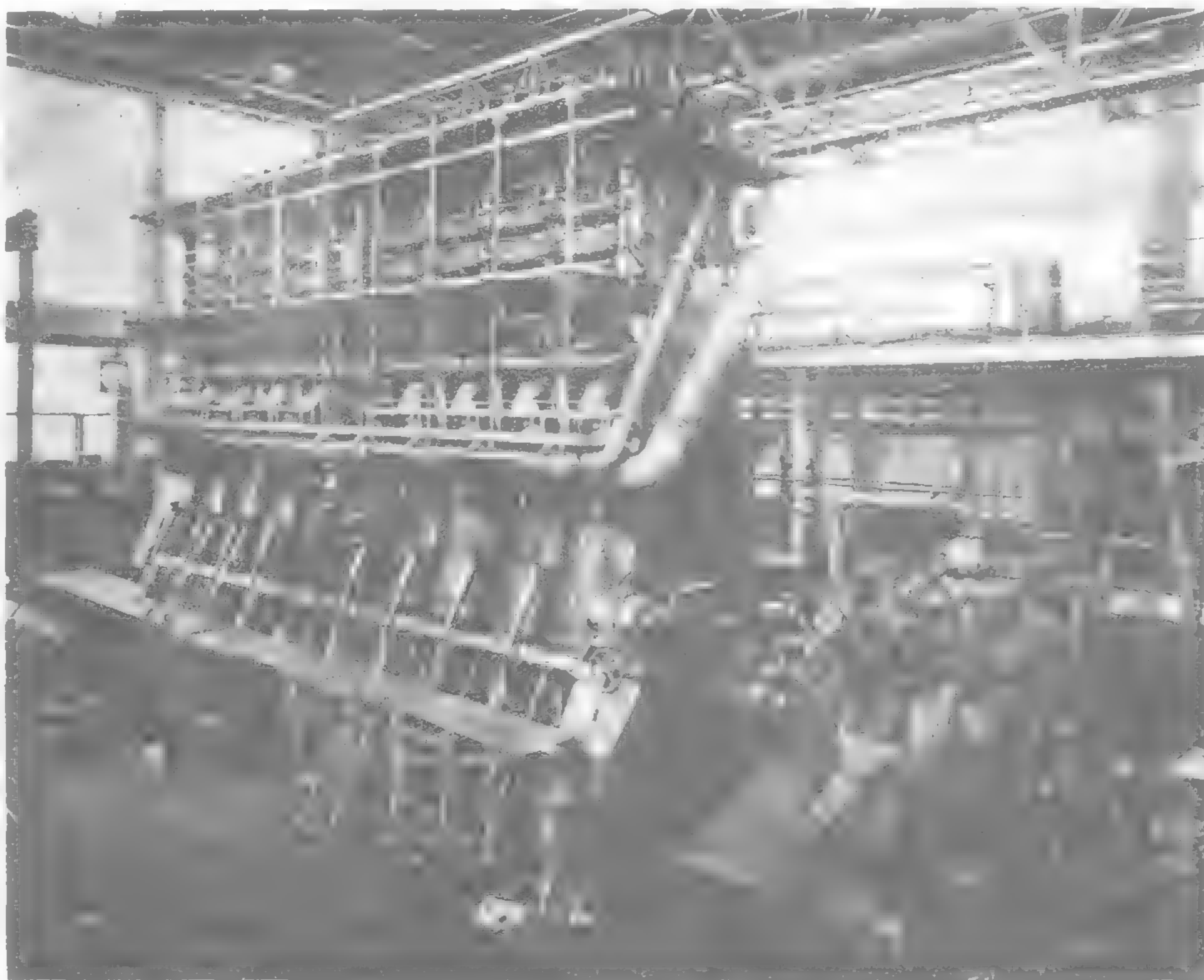
### Propelling Machinery

The main engines consist of two sets of Burmeister & Wain, Diesel engines.

8,680 D.S., four-cycle, double-acting, air-injection type, with eight cylinders of 680 mm. bore and 1,600 mm. stroke. The normal rating of both engines is 11,000 B.H.P. at 110 r.p.m., the maximum power being 14,000 B.H.P.

Each engine drives two cylinders, three-stage compressors fitted at the forward end of the main crank shaft. The compressor has a sufficient capacity to supply the necessary air for the fuel injection of its own main engine, and also has the H.P. stage adjustable in order to run the other engine delivering the surplus air thereto, in case the same should suffer from a breakdown of its own compressor, working in conjunction with 25 atm. air connected from the manoeuvring air compressor to the inlet side of the H.P. compressor.

The total weight of the main engines with thrust blocks is about



Main Engines of the New N.Y.K. Motorship "Hikawa Maru" on the Test Bed of the Works of Burmeister & Wain, Ltd., at Copenhagen. Similar B. & W. Diesel Engines are Installed on the "Hiye Maru" and "Heian Maru"

1,146 tons; the total height of the engine is about 34 feet 6 inches, and its length is about 53 feet.

Each main engine drives a propeller of four blades built-up type of aerofoil section.

### Engine Control

The manoeuvring handles are situated on the side of the ship's center at the middle of the length of the engine on the bottom floor. Each engine has two manoeuvring levers, one for the fore group of cylinders and one for the aft group of cylinders, and also a reversing valve lever. By pushing forward the two manoeuvring levers together, gears operate the two pilot air valves, which open the starting slide valve, then 25 atm. starting air, admitted to the cylinder through the starting valve, turns the main engine, and, by advancing the levers further, the pilot valves close the slide valve and cut off the starting air. At the same time fuel begins to be charged to the fuel valve and injected by blast air to the cylinder, and thus the monstrous engine starts with fuel. The amount of fuel injected is regulated by the position of the levers on notches.

When reversing, the reversing valve lever is to be shifted to the astern position, and by admitting air to the reversing gear cylinder, the cam shaft is shifted to engage the astern cams with the valves on the cylinders. By these gears the starting and the reversing of the engines can easily be carried out according to the wishes of the Captain of the ship.

### Electric Generating Plant

Three sets of the B. & W. 325 K.W. Diesel generators are arranged, two in the port wing and one in the starboard wing. The engine is the four-cycle, single-acting type, having six cylinders with a diameter of 330 mm., and a stroke of 600 mm., developing 490 B. H.P. at 290 r. p.m. One three-stage air compressor is attached to the end of the crank. The H. P. and I. P. cylinder are fitted with a volume adjuster, in order to adjust the capacity of air either to a small capacity just sufficient to run the generator engine only, or to a large supply sufficient to act as a manoeuvring air compressor.

The dynamo is a multipolar, compound-wound type, manufactured by Messrs. W. H. Allen, Sons & Co., Ltd., the output being 325 K.W. at 225 volts when running at 290 r.p.m.

An auxiliary Diesel generator of 40 K.W. of Japanese make is fitted in the starboard wing. The dynamo is a direct-current, compound-wound type, output of 40 K.W. at 225 volts when running at 400 r.p.m., the makers being Messrs. Mitsubishi Denki Co.

An emergency generator of 35 K.W. capacity is fitted on the boat deck and is driven by a kerosene engine of 60 B.H.P. The dynamo is a compound-wound 35 K.W. day and night service at 225 volts D. C. when running at 1,200 r.p.m. built by Messrs. Mitsubishi Denki Co.

### Fuel Oil System

The fuel oil is stored in double bottom tanks and deep tanks sufficient for one round voyage of the ship's service.

In the forward corner of the port wing there are two B & W 100-ton fuel oil transfer pumps, driven by a 12 H.P. electric motor through silent link chain, which transfer oil from the deep or double bottom tanks to settling tanks arranged on each wing of the boiler-room. These pumps are also used for shifting the fuel between tanks for adjusting the trim and heel of the ship.

Three sets of fuel oil service pumps of B. & W.'s gear wheel type, are fitted close to the above pumps.

Flowmeters for the measure of fuel oil consumption of the main and auxiliary engines have been supplied by Siemens Halske Co.

### Piston-Cooling and Lubricating Oil System

Lubricating oil is utilized for cooling the pistons of the main engines, 200-tons being circulated per hour. The same supply is used for lubricating the bearings, crosshead guides, and thrust blocks, while the cylinder lubrication is effected through a separate lubricator of eight feed system on each engine. In the aft of both wings there are four B. & W. rotary lubricating pumps, each driven by an electric motor. The capacity of one of these pumps is sufficient to deliver all the oil required for one engine, feeding oil from one of the two large, lubricating oil drain tanks in the double bottom under each oil trough of the main engines, through a large

duplicate filter, to two oil coolers in series. At the outlet of each piston-cooling oil pipe, there is a small inspection tank mounted on an engine column fitted with inspection lid and a thermometer. After serving its respective duties of lubrication, the oil returns by gravity to the drain tank.

Three sets of the Baltic centrifugal purifier No. 801 are fitted forward of the starboard main engine. Two of them are connected to each of the discharge sides of the lubricating oil pump through the preheater, so that a part of the lubricating oil is by-passed, when desired, for purification and returned to the drain tank. The remaining set is used for auxiliary engine lubricating oil cleaning.

Four kinds of lubricating oil are stored in reserve tanks on the 3rd deck in ample capacity for one round of the voyage, these are the bearing oil for the main engine, the cylinder oil for the main engine, the compressor oil for the main and auxiliary compressors, and the bearing and cylinder oil for the auxiliary engine.

### Sea Water Cooling System

Sea water is used for cooling the cylinder jackets, lubricating oil coolers and air coolers. Aft and between the shaft lines, four 250-ton B. & W. sea water cooling pumps of horizontal, centrifugal type are fitted, each directly coupled to a 33 H.P. electric motor. One of these pumps supplies all the cooling water needed for the main engine, and pumps from high or low injection valves on both wings through strainer delivering to two oil coolers in series—in counter current to the lubricating oil—thence to the air cooler to the main compressor, and from there to the main pipe on the engine, and then branches off to each cylinder. On the exit of the jacket-cooling water after cooling the exhaust valve, a thermometer and an electric resistance thermometer are fitted with a meter at the lower platform, the meter being supplied by Messrs. Siemens, Halske Co. This meter is used in parallel with the pyrometers to measure the exit temperature of exhaust gas at each cylinder.

For the Diesel generator and manoeuvring compressor, two horizontal, centrifugal pumps driven by electric motors are provided, one having sufficient capacity for the above cooling. The temperature of the cooling water and exhaust gas at the exit of the cylinder is measured by the same method as for the main engine.

### Injection and Starting Air System

Each main compressor driven by the main engine delivers the air to a 300-litre air bottle fitted in front of the manoeuvring station, at a normal pressure of 60 atms. and two spare air bottles of 550 litres are arranged in the ship's side.

Each Diesel generator is provided with one 80-litre injection air bottle. All these H.P. air bottles are connected by pipe, so that the pressure drop can be compensated among them.

The starting air pressure is 25 atms. at normal, and it is stored in the four air reservoirs, fitted on the 3rd deck above the boiler-room. They are charged by the manoeuvring air compressor and by excess air of the main and auxiliary engine compressor.

The manoeuvring air compressor of the B. & W. double-cylinder, two-stage type is fitted in the starboard wing with a capacity of 14 cubic meters of free air per minute, directly coupled to a 180 H.P. electric motor of 250 r. p.m., supplying the starting air at a pressure of 25 atms.

The emergency air compressor of the B. & W. single cylinder, three stage type is fitted near the manoeuvring compressor with a capacity of two cubic meters of free air per minute at a pressure of 65 atms., directly coupled to a 35 H.P. electric motor. This compressor is chiefly used when all the air bottles are empty and is worked by the current supplied from either the main or emergency generator.

### Ship's Service Pumps

At the forward port wing, ship's pumps are arranged in neat groups. All pumps are the Amaag Hilpert centrifugal type electrically driven and occupying the small floor space in favor of their vertical type. These include one 150-ton bilge pump driven by a 26 H. P. motor, one small bilge pump of 30-tons capacity driven by a 6 H.P. motor, one ballast pump of 250 tons capacity driven by a 38 H.P. electric motor, one fire and wash deck pump driven by a 38 H.P. electric motor at a pressure of 5.5 atms. when used as a

fire extinguisher, two fresh water pumps of 40-tons capacity each driven by a 12 H. P. motor, two sea water sanitary pumps of 100 tons capacity driven by a 25 H.P. electric motor and one emergency bilge pump of 150-tons capacity driven by a 26 H.P. motor.

At the discharge line of the bilge pumps a stream line type bilge separator, supplied by the Stream Line Filter Co., is fitted on the 3rd deck, to diminish the amount of oil in the discharged bilge and to save the oil.

For the hot water service on deck, the hot discharge of the cooling water of the main and auxiliary engine cooling water is utilized, being pumped up to the service line by the sea water service pump from the collecting tank of one ton capacity fitted under the floor.

### Steam Plants

Two boilers of the single-ended Scotch type are arranged in the boiler-room, each having 9 feet 6 inches diameter, 8 feet 6 inches length, with a working pressure of 130 lbs. per square inch. The steam is used for room heating, oil tank heaters, calorifiers, thermotanks, whistles, cleaning oil tanks and also in galleys and laundries.

There are necessary auxiliaries for steam plant in the boiler-room such as two Weir's feed pumps, one surface type feed water heater, one non-vacuum type surface condenser, one motor-driven condenser cooling pump, one cascade tank, one evaporator of 40 tons per day, and one Yokohama-White oil-burning unit, etc. A 30-ton boiler feed water tank is provided in the double bottom of the engine-room.

### Ventilation System

The engine-room is mechanically ventilated by three A.E.G. ventilating fans each delivering 31,000 cubic feet of air per minute through trunking leading to all parts of the engine-room.

### Passenger Accommodation in General

As the new liner was planned and constructed as an up-to-date passenger carrier, the Company spared no pains in order to meet the demands of discriminating ocean travellers. In addition to the beautifully furnished, comfortable Public Rooms usually found on modern passenger ships, it has both glass-enclosed and open promenade decks for the recreation of passengers during the voyage. A nursery for children and a dark room for amateur photographers are also found on the ship. Moreover, as the new liner is motor-driven it is entirely free from coal-dust and smoke.

The *Hikawa Maru*, and her sister ships, are the first Cabin Ships ever built for the trans-Pacific traffic, with accommodations for both Cabin and Tourist Cabin classes, offering the opportunity for trans-Pacific passengers to travel at low rates with the least sacrifice of comfort.

The Cabin class passenger quarters, are arranged on the central part of "A" and "B" decks. There are 34 staterooms, many with private baths attached, including a Suite de Luxe and a number of single-bed rooms. All Cabin class staterooms are outside rooms with either large windows or portholes opening direct on the sea, and are provided with comfortable full-length beds with Simmons's Beautyrest spring mattresses. They are unusually spacious and furnished with dressing-tables, bedroom chairs and washstands with hot and cold running water and heated and ventilated by the Thermotank Punkah Louvre system. In consideration of the cold weather that might be experienced during the winter season on this northern route, steam heaters are also placed in both Cabin and Tourist Cabin quarters, in addition to the above hot-air system. The Suite de Luxe, situated on the port side of the "A" deck comprises a sitting-room, bed-room and lavatory.

### Public Rooms

The Public Rooms of the *Hikawa Maru* are sumptuously decorated and furnished by the Paris firm of Marc Simon, whose unique decorative work has already been seen on the *M.S. Chichibu Maru*. The decorations of the Public Rooms of the *Hiye Maru* are handled exclusively by her builders, the Yokohama Dock Co., and those of the *Heian Maru* are jointly executed by Messrs. Wylie & Lochhead, Ltd., and Messrs. Heaton, Tabb & Co., Ltd., both of London.

### Dining-Saloon

The Dining-Saloon for the Cabin Class, at the fore part of the "B" deck, has a seating capacity of 80 persons. It is treated in modern style, and, though remarkable for the simpleness of its lines, bears a note of quiet elegance. Pilasters of pear-tree wood between the windows are ornamented with pieces of silver-shaded bronze, to which lights are fitted. The center of the wall of the fore end is occupied by a large silver mirror. At the middle of the aft end, there is a large sideboard of walnut in three parts, the top of which is covered with grey marble. The ceiling of painted wood has lighting devices in the ground glasses in its recess. The Dome in the center is illuminated by lights concealed in a glass-enclosed case made of wrought iron and engraved glass.

### Reading and Writing-Room

The Cabin class Reading and Writing-Room is on the port side of "A" deck adjoining the Lounge. The wainscoting, panels and pilasters in lemon-tree wood and the floor covered with colorful moquette carpet, give to the room a very luxurious and bright atmosphere.

### Smoking-Room

This is situated at the aft end of "A" deck. The walls, lined with palisander and dark walnut, are designed to impart height to the room.

The fire-place in the center of the fore wall, with large pilasters and a stone hearth, is brightened by a central silver mirror the full height of the room. The angle settees of walnut placed in the recesses adjoining the fire-place are upholstered in leather and provided with comfortable feather cushions in velvet. The ceiling is composed of veneered panels with gold frieze, and in the center is a large glass-enclosed case of wrought iron and ground glass in four divisions. The entire floor of the room is covered with ruboleum. The door in the center of the aft wall leads to the Verandah.

### Lounge

This luxurious social room for Cabin Class passengers is at the fore part of the "A" deck. The panelling in sycamore wood matches the ceiling painted and enhanced with cornice in gold. The fore part of the room opens to the Bridge deck by two double windows with large damask curtains. Pilasters in polished sycamore wood are decorated with carved work on the upper parts. The central panel over the mantelpiece is a large mirror surrounded by painted wood enhanced with gold mouldings. On the mantelpiece stands a carved piece, on each side of which is an alabaster vase, within which is a searchlight that projects light to the dome. At the center of the ceiling, there is a large glass-enclosed case constructed of wrought iron and ground glass, inside of which is installed a powerful lighting device.

A grand piano of polished palisander, the rich furniture and the decorative effect of many potted plants give the room a luxurious appearance and make an ideal gathering place for the passengers during the voyage.

### Nursery

The Nursery is on the "B" deck near the Dining-Saloon and is furnished with all kinds of toys and playthings agreeable to small passengers.

The Enquiry Office is conveniently situated near the entrance to the Dining-Saloon on the "A" deck. All required information regarding itineraries, hotel reservation, etc. can be obtained here.

### Tourist Cabin Passenger Accommodation

As already stated, the provision of the Tourist Cabin passenger accommodation on the new liner is a new feature which requires special mention. The accommodation and the cuisine provided in this class are as good as those of the second class on any other trans-Pacific passenger liner. With the low rates charged for this class of accommodation, therefore, it will be a great benefit to those, who wish to travel economically across the Pacific and who do not care for ostentation.

The Tourist Cabins are arranged on the after part of the "C" deck; they comprise outer and inner rooms, both having ample daylight. There are altogether 23 rooms for this class, i.e., nine

rooms for two persons, five for three persons and nine for four persons; the total number that can be accommodated in this class is therefore 69 persons.

The modestly decorated Dining-Saloon for the Tourist Cabin passengers is on the port side of the "C" deck. The comfortable Lounge and the Smoking-Room are on the "B" deck and are surrounded by a spacious Promenade deck.

### Steerage Passenger Accommodation

The Steerage accommodation is at the fore ends of the "C" and "B" decks. As in the case of the superior classes on this liner, the Company has given no small consideration to the comfort and convenience of steerage passengers. There are 20 immaculate compartments for 138 passengers, of which five compartments contain four berths, one six berths and fourteen eight berths. Each

berth is provided with a comfortable mattress, clean bedding and a pillow. Sanitary matters in this class are also thoroughly looked after. Moreover, the quarters are well ventilated by the latest Thermotank Punkah Louvre system and are heated by the same device in the cold weather.

Besides a spacious Dining-Room on the "C" deck, a Smoking-Room and a Lounge, both on the "B" deck are also provided. There are Japanese as well as European style baths for the use of passengers in this class.

### The Name of the Ship

The name of the *Hikawa Maru* is taken from the much-venerated, ancient Shinto shrine, Hikawa-jinsha, situated in the flourishing town of Omiya, 19 miles north of Tokyo. This is the most important shrine in Musashi Province and dates from the time of the Emperor Kosho Tenno (475 B.C.).

## Engineering Notes

### RAILWAYS

**SIAMESE-COCHIN CHINA RAILWAYS.**—The construction of a railway line from Saigon, in French Cochin China, to Battambang and Siso-phon, in Cambodia, has been decided upon, and the work is to be put in hand shortly. The line will be linked up with the railway from Bangkok, the Siamese capital, to the Cambodia frontier, which is at present under construction.

### INDUSTRIAL

**OIL BORNEO.**—A new concern, called the Borneo Oil Company, has been formed for the exploitation of oilfields in Dutch Borneo. With other foreign investors, the well-known Japanese shipping and trading company, the Mitsui Bussan Kaisha, hold interests in the new company.

The concessions to be exploited by the Borneo Oil Company are three in number and are officially registered as Koetei I and Koetei II (from the river of that name), and Kariorang, situated north-west of the Bay of Sangkoelirang, about halfway down the east coast of Borneo.

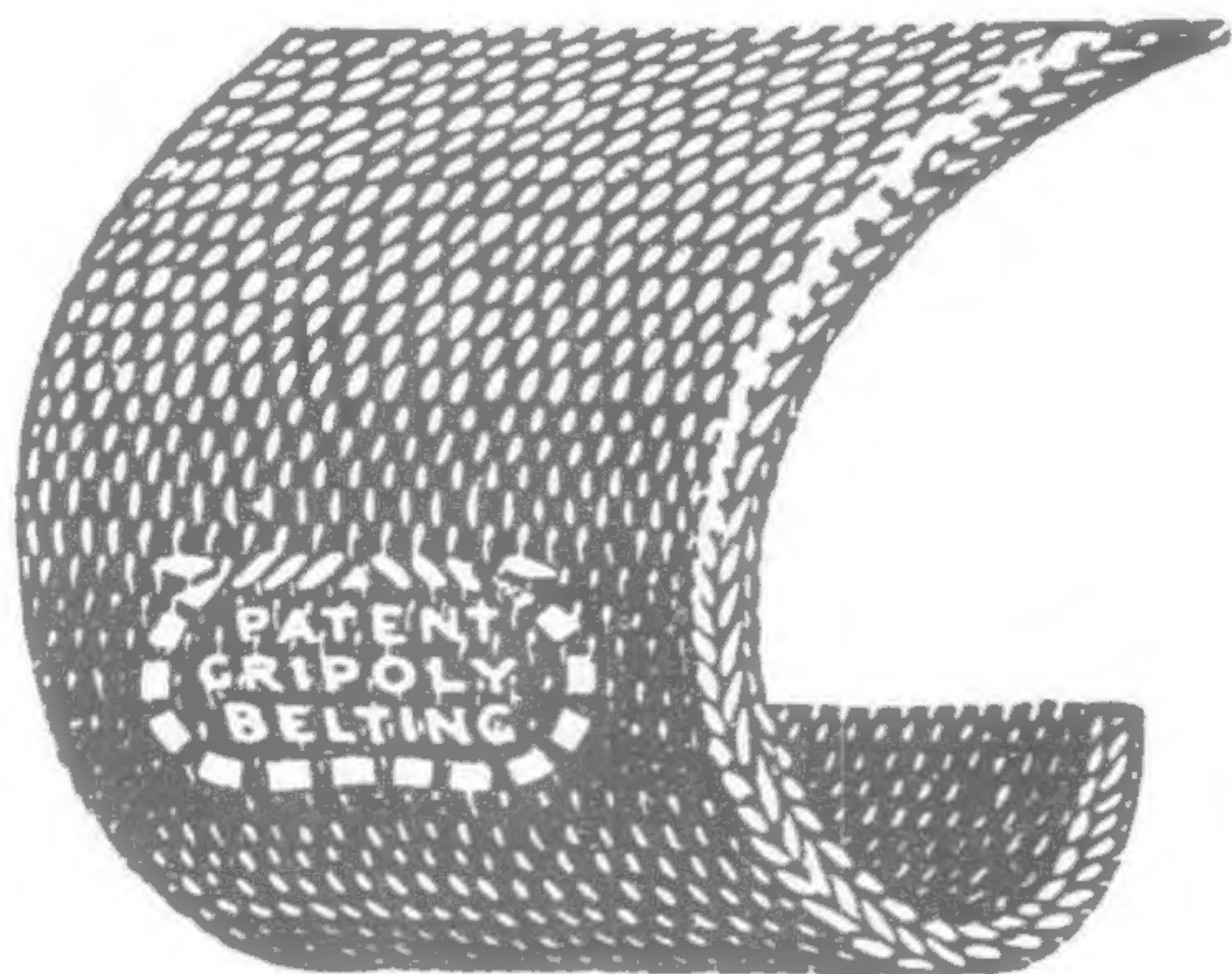
### SHIPPING AND SHIPBUILDING

**EAST ASIATIC CO.'S CARGO LINER.**—The 8,000-ton motor passenger and cargo ship *Boringia* has been launched from Burmeister and Wain's yard. This vessel is for the East Asiatic Co.'s service between Europe and the Pacific Coast and is 442-ft. long with a beam of 57-ft. and a depth of 40-ft. The draught is 28-ft. 3-in. Twin-screw seven-cylinder four-cycle single-acting machinery will be installed, developing a total of 6,700 i.h.p. The motors run at 138 r.p.m. and

have cylinders 630 mm. bore with a piston stroke of 1,300 mm. The *Boringia* will maintain a speed of 14 knots.—*The Motor Ship.*

### PUBLIC WORKS

**BRITISH FIBROCEMENT CONTRACT PLACED.**—"For the work of supplying and erecting the steelwork of the new building at Erith, Kent, the British Fibrocement Works Ltd. have placed the order with Messrs. Royce, Ltd., Electrical, Mechanical and Constructional Engineers, Trafford Park, Manchester. Competition for the contract was keen and widespread. The building will be 280 feet long by 105 feet wide and is to consist of seven Bays. Royce Ltd. are an old-established firm reputed the country over and is controlled by Mr. F. H. Royce of Rolls Royce, Ltd. This order along with one to



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### ROADS

**KIANGSU PLANS BIG SYSTEM OF MOTOR ROADS.**—The Kiangsu provincial department of reconstruction has embarked on a project to construct a system of provincial motor roads which will greatly facilitate travelling and transportation of goods in the province. The proposed roads are the Kwachow-Hsuechow, Shanghai-Nanking, Nantungchow-Haichow, Haimen-Kiangsu and Nanking-Changshuh highways.

According to the present scheme of the reconstruction department, the Kwachow-Hsuechow highway will be the first to be constructed. Starting from Kwachow, on the northern bank of the Yangtze, opposite Chinkiang, it will traverse northern bank of the Yangtze, Kaoyu, Paoying,

Tsingkiangpu, Szeyang and Sutsien and terminate at Hsuechow. It is pointed out that since Yangchow, Tsingkiangpu and Hsuechow are all important commercial centres in northern Kiangsu, the proposed motor road will not only facilitate communication in northern Kiangsu but will also accelerate transportation by providing a convenient link with the Lung-Hai and the Tientsin-Pukow Railways for all the cities. A small section of the road approximately 80 miles long has already been built along the Grand Canal between Kiachow and Chungking, and is now open to motor bus traffic.

The Shanghai-Nanking Highway will start from Nanking, and, extending southwards through the mountainous regions of Kuyung, Liyang and Iking, a city near the southern border of the Province—from where there are roads leading to Changking, Huchow and Hangchow, in Chekiang, and also to Kwangteh, in Anhwei—will turn eastwards along the Taiho Lake to Wusih, Changshuh, and terminate finally at Shanghai.

The Nantung-Haichow Highway will start from Nantungchow, and, after passing through Hai-an, Tung-tai, Yencheng, Fowning and Kuanyuin, terminate at Haichow. As Nantungchow is

potentially a great river port in the south, and Haichow is the eastern terminus of the Lung-Hai Railway and an important outlet for Central China, the proposed road is expected materially to increase the prosperity of the various cities through which it will pass.

A motor road has already been constructed between Nantungchow and Hai-an, and by utilizing the eastern bank of the Grand Canal, an extension of the road from Hai-an to Funing will also be constructed.

The Kiangpu-Haimen highway will run from Haimen through Nantungchow, Tsingkiang, Taihing, Taichow, Yangchow, Icheng, Luhoh and Pukow and terminate at Kiangpu eight miles south of Pukow. It is expected that this proposed road will greatly facilitate transportation between these cities and relieve the congestion of traffic in the various small tributaries of the Yangtze in this part of the Province.

The Nanking-Changshuh highway will start from Nanking and pass through Kuyung, Kintan, Changchow and Kiangyin, terminating finally at Changshuh. This line will facilitate development of the various cities.

The total mileage of the five projected highways will be approximately 1,200 miles. Part of the required expenses has already been appropriated by the Provincial Government and work is expected to commence immediately.—Kuo Min.

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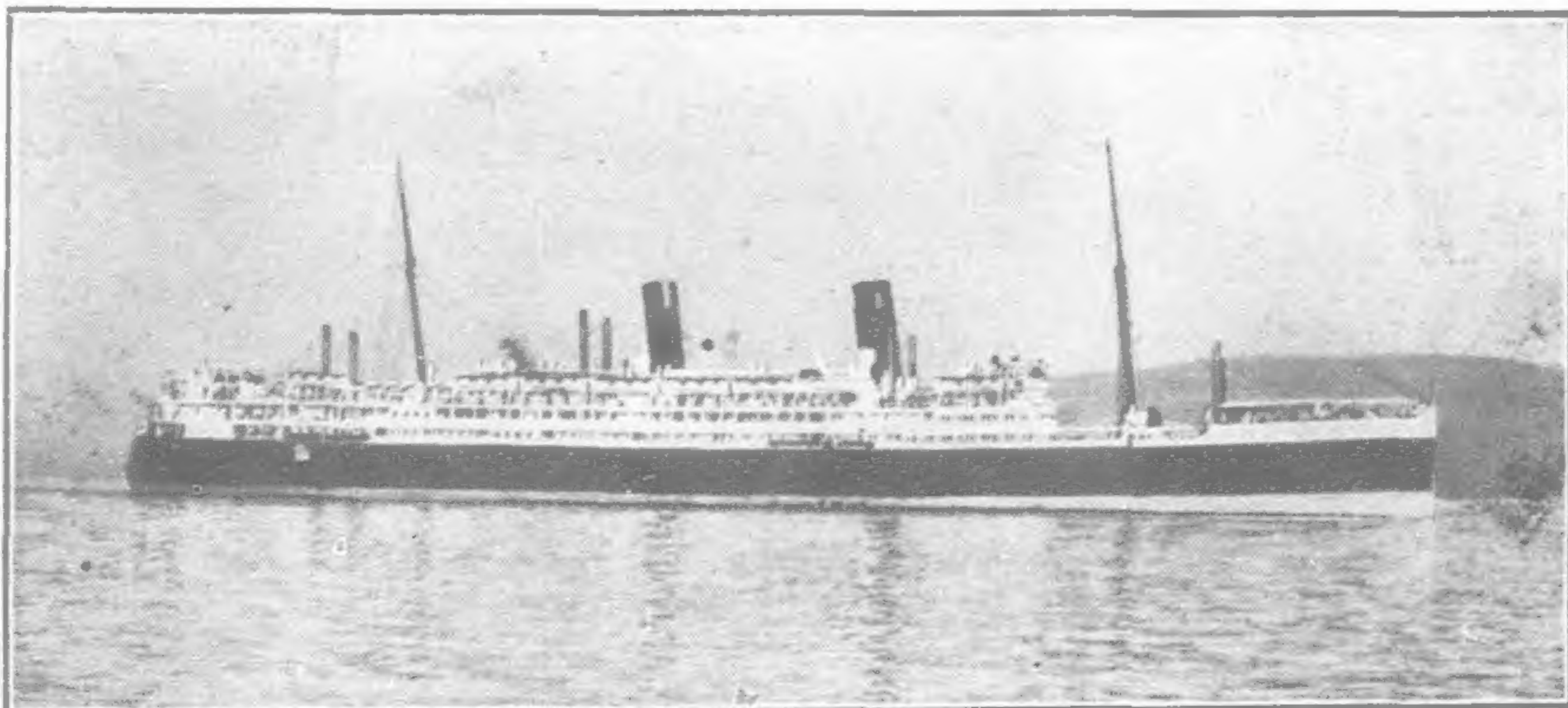
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